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UNIVERSITY OF ALBERTA

EDUCATION AND FARM OUTPUT: EVIDENCE FROM MODEL "C" RESETTLEMENT SCHEMES IN ZIMBABWE

by

DANIEL MTETWA

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

INTERNATIONAL AND INTERCULTURAL EDUCATION

DEPARTMENT OF EDUCATIONAL FOUNDATIONS

EDMONTON, ALBERTA
SPRING, 1992

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ISBN 0-315-73010-2

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DEGREE: DOCTOR OF PHILOSOPHY

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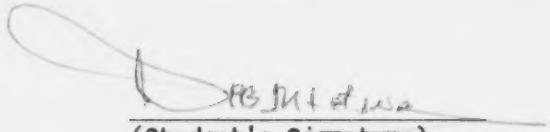

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SUBMITTED BY: DANIEL MTETWA

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN INTERNATIONAL/INTERCULTURAL EDUCATION.

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DEDICATION

This thesis is affectionately dedicated to my parents without whose unwavering support throughout my life, this would never have been written.

I am indebted to my late father, Petros Mubonisi Mtetwa, for his loving devotion to me and his constant encouragement for the furthering of my education. Even when he knew he may not be living by the time I completed my M.Sc degree at the University of Reading - (U.K.) he still encouraged me to complete a masters degree and instilled in me the confidence to proceed to a doctoral degree.

To my mother, Florence Htatywayo Mtetwa, I express my deep appreciation for her perpetual love, support and inspiration. At the time she most needed my support as a widow she still insisted I leave my country, encouraging me to complete my higher education and constantly reminding me of the absolute importance of this task, not only to me, to her and my late father, but to my country and the world.

ABSTRACT

This study examines the relationship between education for the individual farmers and their farm output and see how education (formal, informal or non-formal) has contributed (more effectively) to the farm output of individual farm families in the selected "contractual" Model "C" resettlement schemes in Zimbabwe. Although the advent of independence after prolonged colonial domination brought a vast expansion in the educational system and equitable distribution of fertile land to most Zimbabweans, black farmers who were resettled in Model "C" Schemes had already been educationally disadvantaged prior to independence.

The study begins with the idea that knowledge and skills possessed by individual farmers enhance their farm output capabilities such that they constitute capital in the same sense that the physical means of production constitute capital has become the basis for policies and programmes in formal and non-formal education in capitalist and socialist states alike. In this study, human capital theory has been examined together with the modernization and dependency theories to examine the influence they have had on the farm output patterns of small-scale farmers in Zimbabwe, particularly in the Model "C" Resettlement Schemes.

The findings revealed that there is very little relationship between a farmer's formal education and his/her farm output. However, formal education for the farmers' family members over age 14 made a positive contribution to cotton and wheat farm output

and not for milk. As such, there is need for some formal education in a farmer's family in order to interpret and implement innovations and the new farming technology. On the other hand, informal and non-formal education factors made a high contribution in the farm output of cotton, wheat and milk.

The major strengths of the informal and non-formal variables influencing the farmers' farm output were the farming information from the agricultural extension officers, the number of years a farmer farms in the scheme, a farmer's frequency in attending agricultural extension courses, a farmer's age and the use of an appropriate cowbreed for higher milk output.

Although agricultural extension was most important for farm output in this study, there were other means of disseminating information to farmers which were examined in the study, such as, agricultural information from the radio, agricultural publications, newspapers, discussing farming activities with other farmers in the scheme, as well as neighbours, friends, family members and a farmers' committee.

From the findings of this study, it was concluded that the process by which formal, informal or non-formal education makes its impact is by better allocation of resources (i.e. increased allocative efficiency). It was also concluded that formal and non-formal education, including agricultural extension services complement each other.

ACKNOWLEDGEMENTS

This thesis has been the fruitful culmination of a great deal of time, effort, and sacrifices of many individuals over a number of years. To them all I would like to say, "Thank you Very Much."

On the same note, I wish to express my sincere thanks to my supervisory committee, Drs. M. K. Bacchus, A. M. Decore, D. S. Gill and R. Whitehouse for their interest, encouragement and effort which have contributed to the completion of this thesis. My sincere thanks to Dr. Al. Mackay and Professor J. Young for serving on my committee.

My special debt of gratitude is extended to my thesis co-supervisors, Drs. Kazim Bacchus and Anne-Marie Decore. Their guidance and inspiration motivated me to work diligently. The carrying out of such a study, which deals with a diverse set of issues and caters to a broad range of interests, would not have been possible without their patience and guidance, and readiness to help at all times. Their enlightening comments and suggestions have contributed immensely to the success of this study. My appreciation and gratitude are also extended to my External Examiner, Dr. M. Zachariah of the University of Calgary.

The completion of this study alone cannot adequately compensate those whose love, sacrifice, and support have fortified me during its execution. For her contribution and support for my educational pursuits and to my life, I sincerely thank my wife, Dr. Celani Mtetwa. To my children Sifiso, Sithabile and Sindiso,

special thanks for being so cooperative, patient and understanding, even when what was rightfully theirs was denied them.

This study would not have materialized had it not been for the Research Assistantships, loans, grants, financial assistance from individuals and awards received from the Department of Educational Foundations, International Centre, Alberta International, Dean of Students Services, University of Alberta, Dr. A. M. Decore, The German Agency for Technical Cooperation and the Canadian Commonwealth Scholarship and Fellowship. I particularly express my deep gratitude to Mr. R. Maposa and Mrs. J. Chavarika of the Agricultural Development Authority (A.D.A) in Zimbabwe who assisted me in the collection of data during my field research. To all the above mentioned, I say, thank you and keep up the good work.

Credit and thanks are whole heartedly extended to Terry Mantyka who smilingly and cheerfully turned my illegible writing into something that one would want to read. Without her friendship, understanding and patience, the completion of this thesis would not have been achieved at this point in time.

Finally, I wish to express an abundance of thanks to all the members of the Department of Educational Foundations for their assistance and tolerance when my demands were at times excessive. I also owe much to the Zimbabwean Government for offering me a scholarship towards the end of my Ph.D. programme which added

dimension to my intellectual ability. Last but not least my deepest thanks are extended to my mother, mother-in-law, brothers and sisters including their families for their unfailing support, understanding and encouragement during my studies abroad. Also may God bless (you) my brothers and sisters for your kindness and the trouble you went through to look after our mothers and property during our absence.

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CHAPTER I

THE PROBLEM

Background to the Problem

> First we must educate adults. Our children will not have an impact on our economic development for five, ten or even twenty years. The attitudes of adults on the other hand, have an impact now. (Julius K. Nyerere-United Republic of Tanzania, 1964: Vol. 1:xi)

The majority of the population in economically less developed countries (LDCs) live in rural areas on either subsistence in traditional agriculture or are self-employed in the informal sector of the economy. The relationship of formal, non-formal and informal education and their farm output can be seen in the farm yields they produce, the incomes they generate from raising livestock and selling their farm produce. But the relationship of education to farm output in LDCs has been a matter of debate since the early 1960's. At that time, the account of research done on this subject was inadequate and much of the public thinking was based upon hunches of one kind or the other.

The objective of this thesis is to contribute to an understanding of the relationship between education (formal, informal or non-formal) and small-scale farmers' farm output in Zimbabwe. It concentrates on the Model "C" Resettlement Schemes' small-scale farmers. Its data base is also limited to these

schemes. The primary source material consists of the levels of formal education the farmers have, including the members of their families living with them, their exposure to informal and non-formal education, including agricultural extension education and their agricultural output over a period of their stay in the schemes. In order to appreciate the relationship between the Zimbabwe small-scale farmers' education and their farm output, one has to know the history of their educational and agricultural development background. Details of the history and background to the development of education and agriculture in Zimbabwe is covered in chapter two of this thesis.

Education in Zimbabwe during the colonial period (1890-1979) reflected the political economic and cultural interests of the colonialists. The education system in the then Rhodesia provided a very high level of free state education for the white minority. The blacks were provided with a very low level of fee-paying education. Their schools were run by missionaries, or entrepreneurs whose teachers often had no education beyond primary school.

In contrast, nearly all white children went on to secondary school, and from there into higher or vocational training, while there were very few secondary school places for blacks. Those who managed to procure a place were then forced to pay enormous fees. Statistics show that for every 100 black children in 1970 who

entered primary school, only 28 completed primary education, and of these, 6 entered secondary school and only 4 managed to complete Form 4. The handful of black students who managed to get as far as University, discovered that informal rules excluded them from science and engineering courses, and they found themselves being channelled into arts or humanities courses. Most of the small-scale farmers under study went through that system of education.

It has also been estimated that 1,000,417 African adults were illiterate at the end of 1976, and just under 400,000 were semi-literate. Together, these represented forty-five percent (45%) of the African adult population at the time who were living and to a large extent, still live and farm in the rural areas of Zimbabwe. As such, it is assumed that these people have been largely cut off from participation in productive development programs requiring literacy skills, and that they have been isolated from the benefits for themselves, their families and their communities as a result. Nine years later in 1985, the Zimbabwe Report on "Education with Production", Vol. 1 No. 2, p. 104 (1985), reported that 1.9 million Zimbabweans were still illiterate. It was also estimated that seventy percent of the adult population was illiterate or semi-literate in 1985.

As a result of the colonial limits on education for blacks, there has been an unquenchable thirst for education in Zimbabwe

since independence, because education is seen as a tool and gateway to economic security, to better paying jobs, to social status, prestige and to greater farm output in the future. Education is also viewed as a necessary tool for modernization and as the first step to eliminating illiteracy, disease and ignorance (Kumbula, 1979).

Prior to independence, there were very few non-formal education or adult education programs for the majority of black Zimbabweans. So, black people who could not be included in the formal education system, had little chance of being exposed to adult education. At independence, it was quickly realized that adult education programs were necessary to tap the reservoir of untrained or undertrained potential particularly in the rural areas. Adult education programs are being run, but almost exclusively by the voluntary organizations like the "Adult Literacy Organization of Zimbabwe" (ALOZ). Predominant are the adult literacy courses which now reach over 13,000 people each year, and which serve as focal points for community action programs. Other programs specifically for women are aimed at providing women with opportunities and means for full participation in the economic and social life for this new nation. Young people are also a target group for urban non-formal education programs, as are various community settlement schemes and rehabilitation programs for young offenders.

Over and above the educational restrictions for the majority of Zimbabweans during the colonial period, subsistence agriculture on small plots of land has been the way of life for the vast majority of African people in Zimbabwe. The majority of farm families in the country still plan their farm output primarily for their own subsistence using the basic variable input of family and village labour in their agriculture. Because of this and the low farm output which emerged from the rural sector of the economy, (i.e. the ever-widening gap between the total marketed value of farm output from communal areas and the commercial agricultural sector) there was and still is great need to increase agricultural farm output of communal agriculture and reduce this gap.

The Zimbabwe peasant economy reveals that as the rural population continues to grow, the output of export crops or products contracts (Lindhal, 1979:37). The soil in most peasant areas has been cultivated more intensively. Consequently, there is an increase in the exhaustion and erosion of the soil.

Agriculture in Zimbabwe, prior to independence, was divided into European and African agriculture. European agriculture was heavily subsidized by government while African agriculture was utterly neglected. European farmers were offered training, received Land Bank Loans to help establish themselves, and a wide range of extension facilities were placed at their disposal. Very little money was given for the development of African agriculture.

The black Zimbabweans were overcrowded in very poor unproductive lands unsuitable for agricultural production.

General Statement of the Problem

In the pre-independence period, the majority of black Zimbabweans had extremely limited access to formal, and non-formal education. The allocation of the most fertile land to a minority of white farmers and the limited infertile land to a majority of the black farmers dispossessed the blacks of most of the more fertile land and undermined their economic self-sufficiency. This contributed to low farm output by the black Zimbabweans.

At independence in 1980, the newly elected majority government was faced with a number of formidable tasks with regard to expanding educational facilities and the issue of land redistribution through the implementation of the resettlement programs. To achieve these goals, the government adopted an education and land policy based on the concepts of reconciliation, social transformation and growth with equity. These three concepts were aimed at:

- Providing education for all at all levels including non-formal education and the eradication of illiteracy;
- Designing an education system which would develop human resources as a major factor in the overall development of the country;

- Providing some relief of the pressures on over-populated land and,
- Extending and improving the base for productive agriculture in the peasant farming sector, through individual, cooperative or state farms.

The above aims clearly record the Zimbabwean Government's commitment to give education and land redistribution a central and pervasive role in the social and economic development of the country. One of the reasons for changing land ownership pattern and expanding educational facilities was to increase agricultural and farm output. In general, this has increased farm output, but, in some cases, the output from small-scale farmers is still low.

It is within this context that this study will seek to examine the relationship between education and farm output of small-scale farmers in the Zimbabwean Model "C" Resettlement Schemes. Model "C" Schemes are individual land settlements for small-scale farmers which are combined with a central government estate farm. In these schemes secondary crop processing of cotton, wheat, tea, coffee or dairy is carried out on a large scale.

The Purpose of the Study

The attainment of some level of education is said to be positively associated with increased allocative efficiency (Huffman:1974, 1977; Khaldhi:1975 and Fane:1975). Therefore

education is found to be an important determinant of agricultural farm output with differences among nations (Hayami:1969, 1970). But, one also needs to be aware of the differences in the physical and socio-economic environment in the particular area of study.

The general purpose of the study is to examine the relationship between education for the individual farmers, and their farm output and to see how education (formal, informal or non-formal) has contributed more effectively to the farm output of individual farm families in the selected "contractual" Model "C" resettlement schemes. An attempt is made to identify and compare the differences between the farm output of farmers with some formal education and those without any education or schooling to see in what ways, if any, their education contributes to their increasing farm output. Also, an attempt is made to identify the relationship between the farmers' exposure to informal and non-formal education and their farm output. The above should throw light on whether the exposure of farmers to formal, informal and non-formal education contributes to their increasing farm output.

Hypotheses

The two major hypotheses generated were that:

1. Farmers with higher formal education realize higher farm output, and
2. Farmers with greater exposure to informal and non-

formal education have higher farm output.

Limitations

The study is delimited by the fact that it focused on the relationship of education to farm output only in the Model "C" Resettlement Schemes of Zimbabwe. Other resettlement schemes (Models A, B. D and E) which were not discussed in detail in this study were not included in the sample and only general reference was made to them as examples of other resettlement models being implemented in Zimbabwe. The study is also limited in the sense that it does not examine the majority of the small-scale farmers in the communal areas where most farmers are not educated and are not instructed to use any specific types and amounts of inputs for their farm output.

Significance of the Study

This study was designed to yield both practical and theoretical benefits. The results from this exercise should be of interest to the policy/decision makers in "Intensive Resettlement policies and procedures." Also the results of this study will be of practical use to the administrators, planners and extension staff who select settler farmers for these schemes and also run the respective Model "C" Settlement Schemes. Above all, the parastatal organization - Agricultural Development Authority (ADA)

administering these projects, will have a better base for improving the farm families' agricultural output either in the irrigated crops or dairy farming.

This study is also strategically important because Zimbabwe has only been independent since 1980 and one of the changes that the new majority government made was to expand the system of educational facilities and to resettle the black Zimbabweans to more productive land. However, regarding the exposure of farmers to educational expansion and the availability of productive land, no one has examined the relationship of farmers' education and their farm output. It is, therefore, hoped that this study will be an "eye-opener" for the Zimbabwean government and relevant non-governmental organizations.

Organization of the Study

The thesis is organized into six chapters. Chapter one provides, a general statement of the problem, the purpose of the study, which was the examination of the relationship between the farmers' education and their farm output, the research hypothesis, delimitations and limitations. The study's significance was also noted.

Chapter two explains the history and background to the problem, the development of education, agriculture, extension, education and land resettlement schemes including the resettlement

models used in Zimbabwe, settler farmers selection procedure used for the schemes with more emphasis on the Model "C" Resettlement Schemes, and illegal occupants in some of the schemes. The role of agricultural extension education in Zimbabwe is also discussed in chapter two.

Chapter three describes the theoretical framework for this study and reviews the literature related to education and farm output in economically developed countries, less developed countries and in Zimbabwe. The relevance of the modernization, human capital and dependency theories to education of small scale farmers, their farm output levels and the resettlement systems is explored. The relationship of education to farmers' farm output is discussed in detail. From the literature, conclusions are developed which form the theoretical framework for the study. Also a set of nine research questions used during the field research is highlighted.

Chapter four gives details of the research design and methodology for the study. It explains the research procedure, the population of the study, and the methodology used. It also classifies the procedure used to obtain data. In doing so, the data source is outlined including information on the Zimbabwean Ministry of Lands, Agriculture and Rural Resettlement, Agricultural and Rural Development Authority, Middle Sabi Stage III, A Settlement Scheme and Rusitu Small Scale Dairy Settlement

Scheme. In the research plan, the interview techniques used during the field research, the data analysis plan and the treatment of data are also outlined. Included in that are the selection of the two sample schemes, development of the interview schedules or propositions and testing the propositions through interviews. Also, the use of a descriptive method to record events of farm output, analysis of data or situations, a chronological and systematic picture of the purpose of the study stated in chapter one are presented.

Chapter five reports the analysis of results obtained from the irrigation and dairy schemes. In both schemes the responses from farmers in relation to the possible independent variables that influence the variations in their farm output are analyzed and described. The most significant independent formal, informal and non-formal variables which have a positive relationship with the farmers' farm output are analyzed by the use of a regression analysis method, and the results are outlined and described. From the analysis, propositions were developed which were tested in interviews with participants in the case studies. These propositions form a portion of the findings of the study.

Chapter six presents a summary as well as conclusions, implications and recommendations for further study. The chapter draws upon the conceptual bases discussed in chapter three and the findings in chapter five to formulate the conclusions. Comments

follow regarding the implications of the study and recommendations for policy decision makers in the "Intensive Resettlement Policies and Procedure", administrators, planners, extension staff, Agricultural Development Authority, academic authorities and scholars.

CHAPTER II

HISTORY AND BACKGROUND TO THE PROBLEM

Prior to independence (1980), a segregated system of education developed to serve the racially defined communities in Zimbabwe. One system served the white, Asian and people of mixed race while the other system served black Zimbabweans. The "European" and "African" education departments, while administered by a single Ministry of Education, nevertheless developed as separate and distinct systems. The differences in the regulations and budgetary provisions for the two systems resulted in restricted provision and a lower quality of education for blacks relative to that provided for whites.

The Development of Education in Zimbabwe

> People are both the ends and the means of development. Although improved health, nutrition, and education are ends in themselves, healthy and educated human beings are also the principal means for achieving development (The World Bank, Nov. 1989).

In Zimbabwe, missionary societies were responsible for starting the first schools for Africans before the turn of the century and ever since have played the dominant role in the educational system. The first mission station was established by the London Missionary Society at Inyati in 1859. Before the end of

the century there were ten denominations carrying out mission work. The British South Africa Company made grants of land totalling 325,730 acres to the missionary societies for the purpose of carrying out their work.

The first education ordinance was enacted in 1899 and, while it was mainly concerned with European, Asian and coloured schools, it did provide for financial assistance to mission schools subject to their compliance with certain conditions. Thus was born the system of grant-aided schools which today still forms the backbone of the educational system in Zimbabwe. The effects of the regulations governing the payment of grants, contained in various ordinances during the next decade, were such as to cause African education to develop along agricultural and industrial lines.

In 1910, a committee which investigated the whole question of African development and education recommended that the type of education offered should be a combination of religious, industrial and academic training. Nevertheless, the crafts and skills which it was believed would lead the people to improve their lives in their rural environment continued to be emphasized, while academic work received attention only as it was required for a proper understanding of the industrial and religious subject matter of the curriculum. However, educators were coming to realize the necessity for some properly organized form of academic education. Thus, in his reports in 1919, the Director of Education stated:

> A judicious combination of scholastic and industrial education has been found, not only in Rhodesia, but throughout Africa, to be the best method of raising the native in the scale of civilization and of making him a more useful member of the state.

In 1920 and 1921, the Government opened two industrial and agricultural training schools which aimed at giving Africans a basic knowledge of elementary building, carpentry and farming practice. The problems of African education received some considerable attention from the newly elected legislature in 1923. On the one hand, the missions were complaining that they were receiving insufficient government aid, on the other, the Government was dissatisfied with the quality of the schools and the lack of clear-cut aims in their administration. To the missions these criticisms implied a threat that the Government was contemplating taking over control of African education. In 1924 a commission was appointed to investigate the whole problem of African education and in 1925 this commission made recommendations to halt plans for further expansion of government schools. It however suggested that, as the urban African population increased, the Government might in time have to establish its own schools in the towns. As a result of the recommendations made by this body in 1925, a separate Department of Native Education was established in 1927 which in 1929 was absorbed into a new Department of Native Development. This became responsible for all aspects of African

development, particularly education, agricultural and industrial training, and community welfare. Attempts were also made to improve the very low standards of teaching that prevailed.

In 1935 the Department of Native Education was reformed, but for administrative purposes it was attached to the Native Affairs Department. It was about this time that the social impact of urbanization, brought about by an increasing number of Africans moving to towns in search of employment, began to be felt. In terms of education this meant that greater attention had to be given to academic work and character training to fit the African to cope with the new conditions he was facing, and secondly it meant that the problem of providing educational facilities for the increasing demand had to be met.

It was unfortunate that the difficulties of the war years 1939-1945 should have imposed restrictions on expansion at a time when the African was awakening to the benefits of education. Prior to about 1938, the problem had been to induce parents to allow their children to attend school, for they preferred that the children should help with household tasks, herd the cattle, or till the land. Urbanization, improvements in communications and the enhanced status of a few Africans who had been educated outside the country led to changes in attitudes which produced increasingly insistent demands for education in the post war years.

It was not until 1944, that the government started to establish its own schools. But, in the meantime, in order to meet the growing needs in the urban areas, some missions combined to establish united or nondenominational schools in several centres. Most of these schools have since been taken over by the Government. While there is no clear-cut division, mission schools served rural areas and government schools the urban areas. With the exception of certain missionary groups who refused aid because of their beliefs, and some other registered schools, non-government schools were grant-aided; the money they received covered salaries of teachers and helped pay for the maintenance of buildings, equipment, boarding expenses and clerical costs and, in a few cases, the erection of buildings.

Ever-increasing pressure on the schools in the immediate post-war years resulted in demands from various organizations, particularly the Federation of African Welfare Societies (renamed the Rhodesian Institute of African Affairs in 1956), for greater government support for schools. They were critical of some aspects of missionary control and urged that the Government should take over all schools. Their demands for a full inquiry into the whole educational system led eventually to the appointment in 1951, of a commission under the chairmanship of Dr. Alexander Kerr, former principal of Fort Hare College in South Africa. The commission recommended that government and mission partnership should

continue. Full credit was given to the role that missions had played in the field of education for Africans.

When the Federation of Rhodesia and Nyasaland came into being in 1953, the Federal Government assumed responsibility for the education of European, Asian and Coloured children, as well as for the higher education of all races, but African primary and secondary education remained the responsibility of the individual territorial governments. In so far as Southern Rhodesia (Zimbabwe) was concerned, this meant that the Government was able to devote an increased amount of its attention and resources towards improving the African education system.

In 1956, the administrative ties which had bound the Department of Native Education to the Native Affairs Department since 1935 were severed, and it was given independent status as a fully fledged government department under a minister for African education. In the same year the Government introduced a five-year plan of development aimed at producing more teachers; providing facilities for at least five years of schooling for children of school-going age in rural areas and at least eight years in urban areas; expanding secondary school facilities; and providing more opportunities for technical, vocational and commercial training. In 1959, a new education act was promulgated which would provide a unified teaching service as well as uniform salary scales, conditions of service, disciplinary codes, etc. for teachers in

mission and government schools.

It appears that during the period of the federation of Rhodesia and Nyasaland (1953 to 1963), there were some positive attitudes towards improving African education in Zimbabwe. For instance, in 1952/1953, prior to Federation, the total amount voted by the Southern Rhodesia Government for African education was R.$1,644,548; for the final year 1963/1964, when the Federation was dissolved, the total amount was R.$11,351,546. During the same period pupil enrollment in primary schools increased from 241,300 to 590,795 and in secondary schools from 867 up to 7,045 and the number of teachers employed increased from 7,768 to 15,079.

In 1963 the Judges' Commission submitted a report on education in Rhodesia. As a result of that report, in 1966, the Minister of Education announced a new plan for African education to be implemented over a period of 10 years.

The new plan provided for the following:

(1) A full course of primary education commencing from 1969.

(2) Great advances in the provision of secondary education. Three hundred new junior secondary schools to be opened during the 10-year period. These would accommodate 37.5% of pupils completing the primary course. The plan would also accommodate a further 12.5% comprising the more gifted pupils, in full formal four-year secondary courses.

(3) Rationalization, coordination and modernizing of teacher training institutions.

(4) Government financing with the aid of self-help and voluntary agencies.

(5) Classification of schools into ten grades of A to K, (see Appendix D for details of these grades).

Children were permitted to enter school at the beginning of the year in which they became seven years old but, for various reasons, some entered school at an age somewhat over the average. From then on a child's progress up the educational ladder depended, not only upon his continued interest in school-work and ability in class, but also upon the availability of places at the higher levels. It was said (mainly for financial reasons arising from the stage of economic development in the country) that it was not possible to make education for the African child compulsory, and yet it was compulsory for the European, Asians and Coloureds.

From the above discussion, it is clear that in the years before independence, which were the years that affected the formal educational levels of the farmers under study, Africans were not given enough opportunity to participate actively in education. The differences in the regulations and budgetary provisions for the two systems resulted in restricted provision and a lower quality of education for blacks relative to that provided for whites. The White dominated Rhodesian Front government, which took office in

1962, attempted to control an expanding black educational system by instituting a new fiscal policy relating expenditure for black (but not white) education to the economy of the country. For example, the budget for black education was pegged at 2% of the gross national product, and various economic measures were implemented in order to keep government expenditure within the allotted budget. Also, the government spent twelve times more per primary school pupil in the "European" system than in the "African" system and nearly three times more per pupil at the secondary school level (Dorsey, B.J., 1975). The defects in the Rhodesian educational system, its elitism and consequently its inadequacy in terms of African education, resulted in limited education for black Zimbabweans, including those farmers studied here.

The current Zimbabwean government views education as an instrument for achieving equity and imparting academic and occupational skills. This means increasing or creating more educational opportunities in rural areas. This increased provision of education was evident in this study. All farmers indicated that all their school-going age children were in school and that they helped their parents with field work only after school. This emphasis has also led to the establishment of state secondary schools in the rural areas, which is a complete reversal of former government policy that provided state education in urban areas

only. In addition, the government has launched a national literacy campaign aimed at eradicating illiteracy among approximately 2 million adults over the age of fifteen, i.e. all of Zimbabwe's illiterate population. The campaign was officially launched in 1983 under the auspices of the then Ministry of Women's Affairs and Community Development and assisted by the Ministry of Education. There has been a substantial increase in the non-formal education sector to ensure that the large number of adults who had previously been deprived of the opportunity to gain a worthwhile education can now benefit from programs designed to enhance their skills, knowledge and productive capabilities. Over and above the several study groups which have been established to bring together students learning by correspondence, one of the most successful systems of non-formal and informal education is extension education for the development of peasant agriculture in Zimbabwe. The details of its role in the development of Peasant Agriculture in Zimbabwe are described in the following section.

The Development of Agriculture and Extension Education in Zimbabwe

Three factors account for the pre-independence European dominance and problems in peasant agriculture. First, after 1908 European agriculture was heavily subsidized while African agriculture was utterly neglected. Potential European farmers who were hired from Britain and South Africa, were offered training on

arrival, received Land Bank loans to help establish themselves, and a wide range of extension facilities placed at their disposal. After 1920, control over land, brought with it control over labour by not allowing blacks to own land and the landless blacks became an abundant labour source for Europeans. This reliance on a cheap source of labour was a fundamental prerequisite for the success of European agriculture. African farmers, who had clearly demonstrated their potential in the early colonial period, were not afforded such assistance.

Second, as if the earlier financial discrimination was not enough, a repressive Land Apportionment Act was introduced in 1930 to limit competition. The Act legally demarcated the European area for the first time. The Europeans got 48.5 million acres, or half of the country. The African farm purchasers were confined to separate and unproductive areas, and the majority of the Africans were packed into the unfertile reserves (Peasant Sector), leaving behind only labour tenants in the European areas. Also, the Maize Control Amendment Act of 1934, which restricted the purchase of maize from the African Maize growers discriminated blatantly against African maize growers and effectively undermined the work of the agricultural demonstrators working in African areas.

A Rhodesian governor of the 1940s admitted that insufficient money was spent in the Reserves (Peasant Sector). In the financial year 1940-41, £14,197 was voted for the 'development of

agriculture in native purchase areas and reserves' (Peasant Sector), a sum which, seems somewhat exiguous compared with £208,217 provided in the vote for European agriculture over the same period. The £2 million spent on African agriculture in the years 1945-46 to 1953-54 pales into insignificance when compared to the 12 million voted to the European Sector during the same period.

Third, the competitiveness of the African peasantry was also reduced by increasingly forcing them off the land claimed by Europeans, either by direct eviction or by imposing such a battery of financial and other burdens that they elected to go. Once settled on the reserves (Peasant Sector) they could not aspire to be anything more than subsistence cultivators, hence they opted to become migrant labourers and prepared to work for the prevailing low wages. Those who remained on European farms, as either labour, or rent-paying tenants, were obviously in no position to compete with their landlords.

Against this background, Palmer points out that "The comparative nature of the European versus African farmers in Rhodesia is not as critical as the recognition that there was no planned Agricultural Extension Education and Services within the peasant sector until about 1975" (Palmer, 1977:243-244). This, despite the Rhodesian government's claim that the first planned Agricultural Extension Education and Services began in 1926 when

the government appointed the first European agricultural officer to the Native Department with a staff of eleven African agricultural demonstrators (Rhodesia and Nyasaland, 1960:100).

The appointed officer and demonstrators were to work with an African population that was 530,000 with 55,000 head of cattle by 1900. By 1926 the African population had doubled to approximately one million and the cattle population had increased nineteen times to one million head of stock (Rhodesia and Nyasaland, 1960:99-100).These large increases exerted tremendous pressure on the arable and grazing land which African farmers did not have skills or techniques to manage. This is what prompted the government to appoint the mentioned agricultural officer and his staff.

The extension workers, at this time, worked with the assumption that African farmers lacked skills and new techniques to solve their agricultural problems. The Extension or Advisory Service designed in 1926 was meant only for the African farmers who were to occupy the African Purchase Areas in anticipation of the 1930 Land Apportionment Act. The Africans coming to settle in this special area would be chosen on the progress they made as peasant farmers in the Native Tribal Lands.

The Extension and Advisory Service worked through the use of demonstrators. From the example and results of the demonstration, the extension workers sought to induce comparison and initiative. The integration of cattle into the farming system was similarly

demonstrated. The African peasant farmers who availed themselves of this advice became known and classified as: (1) Cooperators - A cooperator was a farmer who used manure or fertilizer and carried out some rotation and planted crops in rows rather than broadcast cover crops (the only means afforded by peasants then): (2) Plot-holders - A plot holder was one who was believed to be under tuition, to become a Master Farmer and his/her crop program was recorded and (3) Master Farmers - A master farmer was a certificated farmer who carried out all the operations in accordance with advice (Rhodesia and Nyasaland, 1960:100).

According to literature from the Department of Agriculture & Extension (Agritex) in Zimbabwe, from 1926 until 1945, the Agricultural Extension Education and Services showed results of an increasing number of African farmers adopting agricultural innovations. A surplus above subsistence began to appear within selected peasant areas, particularly in the African Purchase Areas. This surplus then found its way into the local developing European or white economy. It was reported that, the traditional social and spiritual outlook on cattle began to include a growing appreciation of their monetary value (Rhodesia and Nyasaland, 1960:100). The changes that occurred as a result of twenty years (1926-1945) of Agricultural Extension Education and Services was estimated to have profited only 20% of the African farmers.

By 1945, the African agricultural situation had crystallized

into a complex agricultural, economic and social problem. To fully understand the response to the African peasant problems, this study quotes a statement by the then Department of Native Agriculture, (Rhodesia and Nyasaland, 1960:100-101):

> The pressure on the land of the increasing population had put a stop to shifting tillage, brought about excessive fragmentation of arable land in many areas into uneconomic holdings and had led to widespread deterioration of the natural resources. The phenomenal increase of the cattle population, with consequent devastation of the grass cover had brought about gross overstocking in relation to the carrying capacity of the land.
>
> To cope with this complex problem no partial or piecemeal solution was adequate, and an overall and basic approach was essential. In this, security of tenure in farming land was fundamental. A sense of responsibility for the protection of the land to be induced. The massive ignorance of adequate farming methods had to be dispelled by widespread adoption of improved practices. Further fragmentation of land had to be eliminated and aggregation encouraged. Capital for development and means for the farmer to participate in it had to be provided. By a combination of all these means stabilization of a reasonable proportion of the African population in full-time farming had to be brought about.

In order to solve the problems mentioned above, a two-pronged attack was evolved between 1945 and 1950. The "Native Land Husbandry Act" of 1951 and the "Native Development Fund Act" of 1949 were used as the legal instruments for the problem. The basic purpose of the former Act was to provide individual security of

tenure through arable and grazing rights. The latter Act sought to provide adequate finance for all these purposes and its canalization into the most effective channels.

The results of the land husbandry scheme included the purchase area which comprised by 1959, 8,052,261 acres with an estimated potential of 17,000 African farms of which 6,013 had been allocated. These farms were held under individual freehold tenure and ranged from 150 to 600 acres with an average of approximately 200 acres. It was this sector, which was comprised mainly of Master Farmers, which benefited from the Native Development Fund Act of 1949. But still, there were limited extension facilities.

As the land husbandry scheme was implemented, the Technical Aid and Extension Services very slowly expanded (Rhodesia and Nyasaland, 1960:105-106). The Department of African Agriculture by 1960 had an establishment of 252 (European) professional, technical and extension officers, 1,200 agricultural (African) supervisors and demonstrators.

The guiding philosophy and aim of this Extension Services was to improve the standard of farming and to raise the level of living of the people as rapidly as possible by marrying sound agricultural extension and sufficient credit facilities with participation of the farmers within a framework of sound land use and occupancy (Rhodesia and Nyasaland, 1960:105).

Within the peasant sector, the African population was reported by the government to be doubling every 23 years. In 1960, the Southern Rhodesia African population was estimated to be 2,590,000 with approximately 2 million cattle. By 1980 (at independence) the rural population in Zimbabwe stood at over 5.6 million people (Commercial and Peasant Sectors) which the Extension Service had to reach, by diffusion or any other means possible. The distribution of extension personnel by program area illustrates the attention given to the European areas. According to the Zimbabwe's Department of Agriculture and Extension (Agritex) Annual Report of October, 1980, prior to independence there were 1,469 extension personnel responsible for the 5.6 million African farmers in both commercial and peasant sectors, a ratio of 1 extension worker to 1,089 farmers. In European farming sectors there were 825 extension personnel responsible for the 6,700 European farmers in large commercial farms. Also, according to Agritex Annual Report, their responsibilities ranged from general administrative agents/assistants, rural youth extension agents or assistants, extension specialists, officers and/or agents who specialized in food crop, livestock and fisheries programs including an agricultural information unit (Agritex Annual Report, October, 1980).

The report also says that there were differences between European and African educational qualifications to serve as an

extension agent. The educational qualifications generally required of extension personnel for the African farming areas were a BSc. degree, agricultural diploma after four years secondary education or three years certificate in agriculture after eight years primary education. Those with a B.Sc. degree and Agricultural Diploma were predominately white while the majority of Africans had certificates in agriculture (Agritex, October, 1980).

On the other hand, educational qualifications required of extension personnel for the European farming sector, were a BSc degree in Agriculture, or two years diploma in agriculture either after four years secondary education or seven years primary education. All the extension personnel for the European sector were white.

Since independence, several extension approaches have been introduced and implemented in order to reach the smallholder farmer with modern and scientific agricultural technology. Zimbabwe has also gradually shifted from the individual approach to extension towards the group approach. This has been necessitated by a shortage of extension workers to reach all farmers on an individual basis. Approaching all farmers individually is time consuming and wasteful in resources since extension workers spend a disproportionately high amount of their time travelling instead of giving extension advice to farmers.

There is also the possibility that individual extension approaches promote inequalities in rural society for there is a tendency by extension workers to spend a large amount of time with the richer and more affluent farmers to the exclusion of the poorer and disadvantaged peasant farmers who need extension services most. Because of these problems, in some communal areas in Zimbabwe, there has been almost a total shift from individual extension strategies to group forms of extension.

The task faced by Zimbabwe is made many times more difficult by the need to undertake simultaneously, the task of educational expansion, general development, reconstruction, land resettlement and restructuring of the economy to ensure that it serves the interest of the population as a whole. As has been evidenced in this study, in Zimbabwe the predominant system of tenure is peasant-owned small holdings. Unlike the observation made in other parts of the world where peasants are landless, in Zimbabwe, even though there are other farming sectors (commercial farms) owning more lands, the peasants still hold on to a piece of land. However, most of this land is of poor quality, with the exception of the newly formulated resettlement schemes which used to belong to large commercial farmers. The better and more productive soils are found in the Model "C" Settlement Schemes under study here. However, the majority of farmers who now own land in the schemes under study came from the low output peasant sector (the old

Tribal Trust Lands) where even if they wanted to change and improve their methods of cultivation and farm output, they did not have the means to do so. Therefore, the allocation of good land to farmers in these schemes, where all farming facilities are provided at cost with open credit facilities, obviously got them motivated for increased farm output especially if the enterprise in the scheme has some relevance to their past experience and exposure to the extension services they have always had prior to joining the scheme.

When one examines the Zimbabwe peasant farm output and its purpose in general, it seems that the peasants cultivate their lands with two goals in mind (1) to feed themselves and their families and (2) to sell part of their crops in order to buy certain commodities that they cannot produce. Over the years there have been varied views on the peasant as a supplier of staple food crops and animals and certain export crops and animals. The peasants have been gradually drawn in and are now heavily engaged in the monetary economy, and indeed these relations (both direct and indirect) with the outside world (urban or outside the country) have consequently influenced and shaped the peasant farm output pattern in Zimbabwe since independence in 1980.

Although this study focuses on farm output levels from the crops and animals in Model "C" Resettlement Schemes, it is important to discuss the types of crops, and animals produced by

the majority of peasant farmers in Zimbabwe. This will give a general picture of the farming background most small-scale farmers under study went through prior to farming in the current Model "C" Resettlement Schemes. The subsistence crops and animals are for peasant families or for other domestic consumption and use. The export crops and animals leave the country or may be used for local industry. Of the two subsistence and export crops and animals, it is important to note the types of crops and animals from communal areas as shown in Table II:1.

For the purpose of this study and its limitations, a few selected crops and animals will be discussed here: (1) cotton and wheat; (2) dairy cows. These crops and animals are chosen based on available data which indicates that these crops and animals are similar to crops and animals found in other Model "C" Resettlement Schemes in Zimbabwe. The production of cotton, wheat and milk is mainly for cash. For purposes of home consumption, farmers are expected to use cash from the sales of these crops to buy food including maize which is a staple food in Zimbabwe.

Cotton (Export Crop)

Cotton is one of the export crops grown by peasants in Zimbabwe. It has had particular problems in its production. It has a very high frequency of being infested by disease and insects at

Table II:1
Type of Crops and Animals from Communal Areas

Area	Major Crops	Subsistence Crops	Animals
Dry-lands	Maize Groundnuts Cotton Tobacco	Sourghum Sunflower Mhunga Rapoko Beans Others	Cattle Donkeys Sheep Goats Pigs Others
Irrigation Schemes	Cotton Wheat/Barley Beans Tea Coffee Maize	Maize Vegetables Rice Others	Cattle Donkeys Sheep Goats Pigs Others
Small-Scale Commercial Areas	Maize Groundnuts Cotton Barley Wheat Tobacco Sunflower Tea Coffee	Sourghum Mhunga Rapoko Rice Potato Yams Vegetables Citrus Fruit Crops	Cattle Donkeys Sheep Goats Pigs Others

Source: Zimbabwe Department of Agriculture and Extension Annual Report, October, 1980.

the various stages of the growth of the plant. The crop requires a lot of labour at harvest time. The crop has been very successful in large and small-scale commercial areas and also some communal areas of Zimbabwe.

The success of the cloth manufacturing industry has been due to a considerable contribution from cotton grown by peasants both from their fields and from European farms where peasants have expended their labour. This crop today is grown in dry irrigated areas of the lowveld where there are both small and large land holdings including the Middle Sabi Stage III A Scheme under study.

From the above background information one can see that the growing of cotton in the Model "C" Settlement Schemes under irrigation is not an innovation to the farmers because it is a crop they have been used to growing before they joined the scheme.

Wheat (Both Export and for Local Consumption)

Unlike cotton, wheat is rarely grown by most peasants because of the unsuitable climatic conditions which are found in most communal peasant areas. This crop grows well where there is lots of water either as irrigation or as rain. Because of this, wheat has had particular setbacks in its production by peasants. The crop needs good management and irrigation even if it is not as highly labour intensive as cotton. As a result, the crop has been very successful in state farms, small-scale commercial farms and

large-scale commercial farms, all under irrigation. The other major crops grown with success in commercial areas are maize, soybeans, tobacco (Flue cured type) groundnuts, sourghum, sunflower and coffee.

Even if the small-scale commercial areas produce similar crops as large commercial farms mentioned above in addition to growing wheat and cotton, it is generally felt that the small-scale commercial sector is producing below its potential. Although the production of crops like maize or cotton have increased, this sector should be capable of producing more, if given the necessary support, such as finance. Since most peasant farmers do not grow wheat, the small-scale commercial farmers should be encouraged to establish more irrigation schemes so that they can contribute more towards the production of essential winter crops such as wheat.

As with cotton, the success of the manufacturing industries, in particular bakeries, has had considerable contribution from wheat grown by small-scale commercial farmers including state farms run by A.D.A. This crop today is grown in almost all irrigated areas of the country. Given the problems in growing wheat under normal peasant farming conditions, it is not surprising that most settler farmers join Model "C" resettlement schemes without much or any technical knowledge on how to grow the crop.

Production trends within the commercial areas (i.e. both

large-scale commercial areas (LSC) and small-scale commercial areas (SSC) are shown in Table II:2. Cotton deliveries to the Cotton Marketing board (C.M.B.) by the small-scale sector rose from 3,037 tonnes in 1982/1983 to 6,526 tonnes in 1985/1986, despite the fact that there were fluctuations in between. Concurrently the areas planted to cotton increased from about 5,000 ha. to 6,500 ha. during the same period. Although small-scale farmers' cotton yield per hectare is lower than the large-scale farmers' yield, over the six years, they had a significant increase in yield from 1982/83 to 1984/85. From then they had declining yields until 1987/88 when they again started to increase their yields by 200 kgs. per hectare. On the other hand, the large-scale commercial farmers realized a more constant cotton yield over the same period.

Wheat is also grown by this sector but it is only a small proportion and figures on output are normally combined with those for Commercial Areas (CAs and A.R.D.A.), with the exception of the year 1986/87 when they had a significantly high yield of 6,815 kgs. per hectare as compared to the 4,700 kgs. per hectare for the large-scale commercial farmers.

Livestock and Dairy (Mainly Commercial for Local Markets)

Attaining a full understanding of the role of livestock in

Table II:2
Production Trends of Wheat and Cotton by Large-Scale (LSC) and Small-Scale (SSC) Commercial Farmers in Zimbabwe (1982/83 - 1987/88)

	1982/83		1983/84		1984/85		1985/86		1986/87		1987/88	
	LSC	SSC	LSC	SSC	LSC	SSC	LSC	SSC	LSC	SSC	LSC	SSC
Wheat												
Prdctn Tons	191,871		110,982		87,766		193,175		197,828			
Area HA	37,329		21,504		16,891		33,619		42,091			
Yield KG/HA	5,140		5,161		5,196		5,746		4,700	6,815		
Cotton												
Prdctn Tons	111,093	2,303	145,340	6,400	154,186	10,000	118,400	5,002	154,293	9,100	143,394	13,500
Area HA	59,863	5,000	72,155	8,000	69,658	10,000	53,000	6,500	68,706	13,000	66,298	1,500
Yield KG/HA	2,270	500	2,503	800	2,584	1,000	2,300	800	2,225	700	2,573	900

Source: Ministry of Lands, Agriculture and Rural Resettlement (MLARR, October 1989). Economics and Markets Annual Report. Harare, Zimbabwe: Author.

the economies of rural Africa remains one of the thornier problems confronting researchers, development planners and practitioners. One of the reasons for this is given by Little, P. (1980:1):

> there are few development issues today which entail a greater complexity of sociological, economic and ecological variables than that of livestock development in Sub-Sahara Africa.

Aside from the inherent complexities involved in Zimbabwe, little attention was devoted to communal area and small-scale farmers' area livestock by researchers in the pre-independence era, (Mombeshora, B.G. 1985:84). This applies equally to technical and socio-economic aspects, although in respect to the latter, the pioneering and still valuable work of Danckwerts (1974) and Theisen and Marasha (1974) should be noted. Theisen and Marasha (1974) say that cattle are also important for paying lobola (dowry) and performing ceremonial functions. Danckwerts (1974) was one of the first researchers in Zimbabwe to recognize that the multiple roles of cattle meant that productivity could not be assessed by direct comparisons between communal and commercial beef production.

There are several studies on the historical importance of domestic livestock to the African peasants in Zimbabwe. The studies on livestock development noted here are by Beach (1977) and the Whitsum Foundation (1978). Besides the use of livestock in ceremonies, marriage and draft purposes, livestock is believed to

live much longer than grain can be stored, they reproduce themselves and they can be supervised (Beach, 1977:45).

Before 1000 A. D. peasants depended entirely upon sheep and goats but later acquired cattle. The proportion of goats, sheep, cattle and other animals, varies from region to region. The size of the animals, cows for example, varies. The Shona cow is generally very small, about 350 lbs. (160 kg.), compared with about 450 lbs. for the average Ndebele cow and about 650 lbs. for Ngami cattle (Beach, 1977:45). However with selective breeding, there are different sizes.

The question of European settlement and then the Land Apportionment Act (1930) which was followed by destocking policies within the peasant sector, versus the long tradition of keeping large herds has been the most controversial issue. The land which was settled after 1930 could not carry the same capacity of cattle. Even with the destocking policy, the peasant herd remained large up to the time of the liberation war. Those who had acquired imported breeds suffered the most as these animals could not stand the harsh conditions, ticks, tsetse fly and various disease for lack of dipping tanks and veterinary services. The peasants who had kept their indigenous cattle did better because these withstood the natural conditions without the supplement survival kit, dip tanks and veterinary services.

Since independence in 1980, a reorientation of research work

towards the needs of small-scale farmers and communal farmers has taken place, and government extension services too have shifted their primary focus from the commercial to the communal sector.

Despite the shift of research work towards the needs of small-scale and communal farmers, the dairy production sector in Zimbabwe is still predominantly composed of large scale commercial farmers. These farmers number approximately 550 and deliver annually about 250 million litres of milk to the Dairy Marketing Board (D.M.B.), a parastatal set up by Government to purchase milk from producers, process it, and then market it throughout the country. In practice, however, most of the dairy products so generated are marketed in the urban and periurban areas. There are several interrelated reasons for this. Due to the nature of milk, the type of products processed, and the distances and terrain involved, distribution and marketing in the rural areas is physically unfeasible and financially nonviable for the D.M.B. Since the majority (over 70%) of the country's people live in the rural sector, demand for milk far exceeds supply in these remote areas.

In order to redress these disparities Zimbabwe has embarked upon a dairy development programme with the objective of ensuring that there is broad based viable production of sufficient wholesome milk and its derivatives at an affordable cost to meet the national needs. More specifically these objectives are:

1. To continue to improve and consolidate the viability of the established dairy sector.
2. To continue the expansion of the national dairy production base to the small scale, communal and resettlement farming sectors, not only to increase the supply of milk but also to stimulate a wide range of development activities to the benefit of the whole community.
3. To maintain and improve effective and strict statutory control over the production, processing and marketing of dairy products.
4. To promote an increase in consumption of milk and dairy products amongst all sectors of the population.

In order to fulfill the Government's policy, the Ministry of Lands, Agriculture and Rural Resettlement appointed a Dairy Programme Coordinating committee which coordinates development, planning and implementation as well as monitoring and evaluating progress to ensure the objectives are being fulfilled and that these remain compatible with the nation's needs.

With reference to the second objective, the strategy is to assist communities with an integrated development process, covering a wide variety of issues and with the twin goal of production of adequate supplies of milk and creation of a viable development base. In more detail the procedure is thereof to:

- contribute to widening of the production base in agriculture and democratization of milk production by assisting small

scale, communal and resettlement farmers to enter the dairy industry;

- increase milk production in rural areas to ensure demand is met and contribute to national needs;
- use milk production as a development tool, thereby increasing incomes, standard of living, health and various other spin off advantages and effects;
- contribute to livestock and resource development within the present agrosystems of the various natural regions;
- encourage the creation of cooperatives, organizations and structures of local government in order to facilitate milk production and marketing.

Implicit in the strategy is that implementing agents will spearhead development, and then gradually withdraw, leaving the people in control of their own program which the various technical support services and advisory agents can continue to guide and assist when required.

Government's objective of ensuring that there is a broad based viable production of sufficient wholesale milk and its derivatives at an affordable cost to meet the national needs is being pursued through this programme. There are several components of the program including state run dairy operations, small scale resettlement farms/schemes such as the Rusitu Scheme, large dairy commercial farms and communal small-scale farmers. Overall this program, in its various aspects has raised milk production significantly. In 1981, Zimbabwe produced 155,826 tonnes of milk. By 1985, production had risen to 200,387 tonnes and by 1988, milk production had risen still further to 244, 109 tonnes (Central

Statistics Office, Harare, p. 11, 1989).

Several studies from the Ministry of Lands, Agriculture and Rural Resettlement reviewed during the field research show that almost all Zimbabwean peasants own or have owned cattle for domestic milk, beef, draft power, marriages, ceremonies and traditional prestige. Given this background, the dairy production under study is not a complete innovation to the Rusitu small-scale dairy farmers. What is new to them is the technology of using a zero-grazing system and crossbreeding their indigenous "Shona" cows with foreign highbred bulls in order to produce a hardy, high milk producing crossbreed progeny.

The Development of Land Resettlement Schemes in Zimbabwe

As a result of land tenure problems and low farm output from communal farmers, the Zimbabwean government, after independence in 1980, formulated three models of intensive resettlement schemes (Models: A, B and C) which were used in the resettlement of farm families. The number of farming families that could be settled on each tract of land depended on which of the three resettlement models was to be used, which in turn depended on the potential for increased agricultural farm output of each area and the expected net annual income attainable per unit. These policies and procedures were stipulated in the original "Intensive Resettlement Policies and Procedures," a document which was prepared by the

Zimbabwean Ministry of Lands Resettlement and Rural Development in late 1980, when the program was still in its infancy.

The original context of a joint Zimbabwe/British Government three year program proposing to settle 18,000 families on 1.1 million hectares at a cost of Z$50 million was redefined in the Three Year Transitional National Development Plan (1982/83-1984/85) which then called for the resettlement of 162,000 families on 9 million hectares over the plan period, subject to practical, financial and economic constraints. Capital expenditure for the program to achieve this target over the plan period was then estimated to be over Zimbabwean $500 million at the then current prices. Given this large sum of money, the program is subject to continuous monitoring and evaluation--with application of corrective action where necessary to ensure that the program is meeting its multiplicity of objectives for integrated development rather than mere settlement of people without development.

Inevitable changes have occurred since independence, both in policy and implementation procedures, calling for a modification of the original land policy document in the light of additional information and experience gained. The Ministry's approach to the program remains flexible and further modifications are incorporated into the document whenever new ideas and knowledge are gained as the program continues to unfold.

By 1984, 32 schemes covering 1.5 million hectares had been

planned for 22,000 families and were in various stages of implementation. By then, 16,500 families were already established in these schemes. The size of the Resettlement Program necessitated some standardization in the planning process. Consequently a number of model planning frameworks were carefully prepared and accepted at the beginning of the program. The standard Models nevertheless were intended to be flexibly applied and it is the responsibility of the planners to tailor the models to individual circumstances insofar as is practicable. Up to now, the questions of land distribution and agricultural development are some of the most critical issues facing the government of Zimbabwe.

Zimbabwe has a total arable land area of about 39 million hectares. Of this about 33 million hectares have been reserved for agricultural production. The remaining 6 million hectares have been reserved for national parks and wild life. At independence, the agricultural land in Zimbabwe was divided into the following subsectors:

> 15.5 million hectares or 47% of the total farm land, was reserved for the large scale commercial and state farming sectors.
>
> 1.4 million hectares or 4% of the total farm land was reserved for the small scale commercial farming sector.
>
> 16.4 million hectares or 49% of the total farm land was reserved for the communal area farmers.

Under the previous land distribution system, agricultural land was roughly divided in half between about 700,000 communal area farmers and 6,700 large scale commercial farm units and 8,500 small scale commercial farms. The land ownership pattern between the large scale commercial farm lands and the communal area farmers concealed a further disparity which existed in the distribution of land categories as depicted by variations in rainfall, soil fertility and therefore land suitability for agricultural purposes.

Table II:3 shows the present land distribution by sector and natural region. The significance of the natural regions is that, prior to independence, all the black farmers in the communal areas were allocated land only in natural regions IV and V which have poor soils and unsuitable for intensive agriculture. The other black farmers in small-scale commercial areas were allocated land in natural regions III and IV, which again were less fertile than the natural regions I and II where all white large-scale commercial farmers owned land. Now, land is more evenly distributed to all sectors in all regions. Although higher percentages of large-scale lands 28.6% and 63.0% respectively are in regions I and II, there is a fair distribution of large-scale lands in regions III to V. Currently, 20.2%, 21.7% and 38.7% of communal areas are now in regions I to III respectively. In total,

Table II:3
Present Land Distribution by Sector and Natural Region (1990)

	Natural Region Area x 100 Ha											
	I		II		III		IV		V		Total	
Total	700		5,860		7,290		14,780		10,440		39,070	
Large-Scale	200	(28.6%)	3,690	(63.0%)	2,410	(33.1%)	2,430	(16.4%)	2,490	(23.9%)	11,220	(28.7%)
State Farms	10	(1.4%)	10	(1.7%)	160	(2.2%)	60	(4.1%)	260	(2.5%)	500	(1.3%)
Small-Scale	10	(1.4%)	240	(4.1%)	530	(7.3%)	500	(3.4%)	100	(9.6%)	1,380	(3.5%)
Communal Areas	140	(20.0%)	1,270	(21.7%)	2,820	(38.7%)	7,340	(49.7%)	4,780	(45.8%)	16,350	(41.9%)
Resettlement	30	(4.3%)	590	(10.1%)	1,240	(17.0%)	810	(5.5%)	620	(5.9%)	3,260	(8.3%)
Other	310	(44.3%)	60	(1.0%)	130	(1.8%)	3,640	(24.6%)	2,190	(21.0%)	6,360	(16.3%)

Note: Agricultural and Rural Development Authority (ARDA) State Farms include land areas covered by resettlement and communal areas. Large-scale commercial farming area figures exclude 198,000 of farms classified as above.

Source: Derived from land acquisition, Central Statistical Office, Department of Rural Development and Agricultural and Rural Development Authority. Harare, Zimbabwe, October, 1989.

41.9% communal areas are proportionately distributed among the five regions as compared to 28.7% total large-scale areas in the same regions.

Since the attainment of independence in 1980, significant progress has been made in trying to redress the inherited inequitable distribution of land through the implementation of the resettlement programme. To date, about 52, 000 families have been resettled on about 3.3 million hectares of land, of which 2.7 million hectares were formerly commercial land. The Government still has to resettle another 110,000 families to achieve its target of resettling 162,00 families. In order to resettle this number of families, about 6 million additional hectares of land will be required, which will displace labourers at present employed on the commercial farms.

In the past, Government came up against a number of constraints in its efforts to resettle families and many of these still remain unsettled. Notable problems include those of land availability, the ever increasing prices of land, the lack of supporting legislation to facilitate the acquisition of land and the contradictions between equity and efficiency. In addition, the capacity of those ministries and departments responsible for planning and implementing the programme are seriously limited in terms of personnel and equipment.

The immediate goal of government is therefore to identify

suitable land for the resettlement of the 110,00 families. Once this is done, it is necessary to ensure that the resettled land is efficiently utilized. This is particularly problematic since a large part of the land sought for resettlement is likely to come from the better natural regions of the country.

At the end of the resettlement programme, agricultural land is expected to be distributed along the lines given in Table II:4.

It will be essential for Government to make sure that the remaining large scale sector is intensively used. The enlarged state farming sector will be required to operate on an efficient and profitable basis. As far as communal areas are concerned, these will be properly recognized in terms of correct land use, so that intensive cropping programs as well as appropriate livestock husbandry methods are instituted and followed by the farmers. To reach the masses in rural Zimbabwe and to give primary emphasis in rural development programs, the following five models for intensive resettlement are now established, and the target income used is a minimum of Z$400 net annual income per family for Model "A", "B" and "C".

(1) Model "A"

In this model there are individual settlements in nucleated villages, with individual arable holdings and communal grazing

Table II:4
Proposed Land Distribution by Sector

Sector	Present	Proposed
Large-Scale Commercial	11.4	4.9 million Ha
Small-Scale Commercial	1.2	1.2 million Ha
Communal	16.3	16.3 million Ha
Resettlement	3.3	9.3 million Ha
State Farm Estates	0.5	1.0 million Ha
Other Ministries	0.4	0.4 million Ha
Total	33.1	33.1 million Ha

Note: The resettlement area includes land previously allocated to communal areas; land under state farms also includes operations in communal area.

Source: Derived from Land Acquisition, Central Statistical Office, Department of Rural Development and Agricultural and Rural Development Authority, Harare, Zimbabwe, October, 1989.

within village boundaries. A typical Model "A" Resettlement Scheme consists of: 500 families in 15 villages linked by maintained roads, with three or four schools, six dip tanks, a service centre housing a Resettlement Officer and staff. Agricultural Extension workers, a co-op worker, animal health assistant, clinic and staff. Within the scheme two or three units are reserved for Model "B" cooperatives.

(2) Model "B"

The properties that are usually selected for this model tend to be those that have well developed infrastructure still intact particularly irrigation, and some specialized agricultural enterprises that can be run as a unit by cooperative groups. The Government carefully assesses, arranges and coordinates support services, especially in the formative period, in the fields of cooperative organization, farm management, agricultural and veterinary extension, credit and administration. Education and health facilities are arranged according to the particular circumstances of the group.

(3) Model "C"

This is the scheme under study in this research project. As shown in Figure II:1, there are seven Model "C" Resettlement Schemes in full operation in Zimbabwe and three are still at the

A. D. A. MODEL 'C' RESETTLEMENT SCHEMES IN ZIMBABWE

DRAWN P. A. C.

DATE FEBRUARY 1991

planning stage. The majority of them (4) are located in Manicaland province. A Model "C" Scheme is an individual settlement combined with a central government estate farm. This model is suited particularly to enterprises where secondary crop processing is carried out on a large scale for products such as coffee, flue-cured tobacco, tea, cotton, wheat or dairy. The individual settlement is on the same basis as Model "A" but the settlers have a commitment to grow and process a cash crop in conjunction with the central estate.

The central estate is run for the government on an agency basis by the Agricultural and Rural Development Authority (A.R.D.A.). A.R.D.A. is a viable agricultural unit with its own resources and labour force and it is financially self-supporting in its own internal operations. Its primary objective, however, is to provide services, training and support to the individual settlers in cash crop production. It also supplies services such as extension services, tillage, transport, and seedlings at an economic rate, and is responsible for infrastructure maintenance.

In conjunction with other Government agencies the central estate provides training facilities for the individual settlers. Depending on the size of the scheme, a service centre is usually provided. Education and health facilities are provided at the same ratios as Model "A" Schemes, taking estate labour into account also. For instance in the Middle Sabi Model "C" Settlement Scheme,

each settler farmer has a ten hectare arable plot under overhead irrigation system. Each settler family is provided with a basic three roomed house which can be extended as soon as the farmer acquires a title deed of his plot. Settler farmers are given two years of probation from the time they join the scheme to prove that they are good productive farmers before they are allowed to purchase their respective plots.

The size of this scheme is 470 hectares with a potential of 47 settler farmers/families. At the time of this study, there were 43 settler farm families and 4 vacant plots. The general minimum educational level for the settler farmers in this scheme is four years of primary education. Since they use irrigation for growing their cotton and wheat, they use a double cropping system for the two crops per year. At the end of every cropping season, an accurate record of their yield per hectare, per plot, per farmer and per year is kept by the farmer, the resident extension worker in conjunction with the central estate management, and all yield records are officially kept by A.R.D.A. Each farmer has a similar record of yields in his own file in order to assess his/her progress over the years of his/her farming. Although there is a systematic way of collecting output records, there is no record kept of the settler farmers' input level.

The Rusitu Small Scale Dairy Resettlement Scheme is also a Model "C" type. There are currently 348 settler farmer families in

this scheme out of the potential 600 families for the scheme. Each settler farmer family has 4 hectares of land where one hectare is exclusively used to grow nappier fodder for the dairy cows and the other three hectares are for residential buildings and other supplementary crops for the farmers.

Each plot holder is allowed to keep up to seven dairy cows under the zero-grazing system. Also each plot is supplied with tap water for the dairy and domestic use. Milking of dairy cows is done by individual settler farmers at their milking parlors which are built according to the Dairy Marketing Board's health standards. The settler farmers deliver their milk daily to the "Central Collection Centres" where the milk is weighed, recorded on both farmer's card and A.R.D.A./D.M.B. official cards, and thoroughly inspected and tested for purity before it is poured into the refrigerated bulk tanks. The Chipinge Dairy Marketing Board Bulk Milk Tanker collects the fresh milk from the Central Collection Centres into Chipinge town which is about twenty-eight kilometers away from the scheme.

Again, records of milk yields per cow per day, per month or per year are kept by both A.R.D.A. and the respective settler farmers. At the end of every month, the farmers receive their cheques for the milk sold to D.M.B. Again there is no record kept of the settler farmer's inputs. Both Rusitu and Middle Sabi Resettlement Schemes are near Chipinge town. The location of these

schemes is shown on the map of Zimbabwe (see Figure II.1) which shows A.R.D.A. Model "C" Resettlement Schemes in Zimbabwe.

There are numerous socio-economic, political, cultural and environmental factors that can be put into account to determine the relationship of education to farm output of farmers in these Model "C" Settlement Schemes. Only some of these factors will be examined within the limits of this study including the availability of extension services, frequency of irrigation, types of cows, and mechanical/non-mechanical tillage power. All these affect farm output in some way or another. For instance, given that all other factors essential for increasing farm output are present, the yield a farmer could get from one unit of land or one cow with the same amount of inputs will not be the same in the dry lands of the country as it would be in the lands under irrigation or in high rainfall areas.

(4) Model "D"

Strictly speaking this is not a resettlement model but a rural development model which utilizes potential resettlement land. It entails the use of ranches in Natural Region B for grazing by communal area communities; each community has access to the ranch once every three or four years. During the time that the community has access to the ranch the community's own grazing within the communal area gets a chance to recover and the people

undertake an internal resettlement and re-organization of their arable blocks and villages so that they free as much of the land for grazing as is possible.

(5) Model"E"

This model is a group ranching settlement on former commercial ranch units with existing basic infrastructure in areas where climate (as in Region V) or lack of arable land preclude a cropping based form of settlement. The group has a total livestock holding of twenty livestock units per settler family, including smallstock.

Settler Selection Procedure

The resettlement of people on holdings in the resettlement area does not normally commence until certain minimum development has been carried out but at the earliest practical date the resettlement processes is started. The first step is the distribution (in the communal lands affected) of Registration Forms by Government officials in liaison with local political organizations or the community authorities and district councils. After registration, a meeting is held, attended by local representatives, an official of the Ministry of Lands, Agriculture and rural Resettlement and the Resettlement Officer. In order to meet the original objectives of the program, special criteria are

applied in the selection of settlers. Settlers are selected on the basis of need in the following order of priority.

(a) Refugees and people displaced by the war; this category includes extraterritorial refugees, urban displaced persons, former inhabitants of protected villages, and former commercial land workers. Some of the commercial farms purchased for resettlement have a lot of these people on them as illegal occupants. They are usually former labourers on the farms and government tells them that they have no specific claim to resettlement by virtue of their presence on the land.

(b) The unemployed and landless; although, in theory communal area residents should always have some land, population pressures in some communal areas are so great that, for all practical purposes, some have no land.

(c) Those with insufficient land to maintain themselves and their families. These include people who are displaced from their land by large public projects.

In the selection procedure attention is paid to an applicant's general ability to sustain himself as indicated by his possession of cattle, stocks of feed, etc. In general settlers are selected from the 25 to 50 year age group. They must be married or be widowed with dependents. Those in employment are excluded.

The implication of the above strategy has been to choose

settlers at random, without due consideration of the skills required for the enterprise they were to be engaged in. While it is true that most of the population depends on agriculture for survival, it does not necessarily follow that all these people are agriculturists or interested in farming. There is therefore a danger of giving a scarce resource to people who may neither have the interest nor the ability to optimally utilize the land resources. It is therefore logical at this stage to critically analyze the selection criteria with a view to changing it in favour of farmers who can productively utilize land. This study begins examining those background input factors that contribute to farmers' farm output.

The Role of Agricultural Extension Education in Zimbabwe

Extension education programs associated with the Model "C" Schemes in Zimbabwe centre around three units, (a) farmers or rural people or clients; (b) innovations or discoveries or inventions; and (c) extension workers or educators or specialists in extension services. No matter how good the program, it only works if farmers in these schemes participate in it and practice it. This is why one of the variables that will be focused on in this study is the effect of extension education programs on farmers' farm output.

Extension education imparts non-formal and informal education

leading to behavioral changes in the desired direction. It is also a process of informing and motivating people to adopt innovations by suggesting alternatives for the needs and resources of the people. In doing so it involves the active participation of people and consequently improves their decision making ability which brings permanent improvement in their conditions. Extension education also develops people's own program by creating a congenial learning situation which builds confidence through action and conviction.

When new ideas are to be introduced to farmers, extension education assesses innovations through field trials, evaluations, adoption, communication and diffusion. It also assesses innovations through overcoming problems of adjustment in different categories of people or farmers. In addition, it assesses innovations through strategic combinations of workable technologies and providing the facts and figures for consideration of consequences.

In general, extension education develops, strengthens and organizes groups, institutions and people to achieve their objectives. It develops leadership in local and professional situation and acquaints the planners, policy makers and administrators with local conditions and the latest technologies suited to it. In doing so, it provides sufficient data for developing plans and for coordination of activities. Last but not

least, it gives direction and a package of educational practices for adoption and diffusion and also provides a communication media mix for innovations and evaluations.

The technological development of education can be related to various fields of Extension like Agriculture and Home Science. Agricultural extension is concerned with agricultural education assisting farmers to bring about continuous improvement in their physical, economic and social well being through their individual and cooperative efforts. It makes available to the farming community the scientific and other factual information and training and guidance for the solution of the problems in agriculture including Animal Husbandry, Gardening, Agricultural Engineering, etc.

In other words, extension education is:

(1) education (non-formal and informal) aiming at assisting people (rural as well as urban) to bring about continuous improvements in their physical, economic and social well-being through their individual and cooperative effort. It makes available to the client system (farmers/home makers, etc.) scientific and other factual information, training and guidance for the solution of their problems in Agriculture/Home Making, etc.

(2) a two-way process whereby the problems of the client

system (farmers, home makers, etc.) are brought by the change agents (extension workers, subject matter specialist of the Agricultural Universities, etc.) for solution to the Agricultural University/Research Stations, Home Science Colleges, Veterinary Colleges, Medical Colleges, etc., and the results are taken back to the client system in an acceptable form (Dahama and Bhatnagar, 1980:95-99).

CHAPTER III

THEORETICAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

There are three major theoretical orientations or approaches to the analysis of development that will be examined. The first is embraced by the "modernization school of thought" which suggests that the development of areas such as Africa will come about only through closer association with the developed countries of the West in a much more comprehensive technological, even ideological sense. The second approach is "human capital theory" which is an offspring of the modernization theory and assumes a direct and positive relationship between improvements in the levels of education and increases in productivity of the labour force. It asserts that the most efficient path to the national development of any society lies in the improvement of its population that is, its human capital" (Fagerlind and Saha, 1983:18). The third theoretical orientation is incorporated into the "dependency school of thought," which views foreign penetration into the political and economic structure of the Third World as a conditioning factor and implies that development can occur only if both internal structures and Third World relations with the economically more developed countries of the west undergo complete change. The purpose of this chapter is two fold: (1) to outline various explanations offered by the modernization school of

thought and the human capital approach regarding the relationship between education and farm output or development and (2) to critically analyze the limitations of the human capital theory within the content of the economically less developed societies through the use of Radical and Neo-Marxist (dependency) approaches.

The Modernization School of Thought and the National Development Experience in Third World Societies

Modernization theory which emerged in the 1950s to early 1960s contrasted sharply with the evolutionary theory of development of the 1920s and 1930s. To some extent this theory was an intellectual response to the two world wars as an attempt to take an optimistic view about the future of mankind. The early forms of modernization theory had little to say about the further advancement of the already modern, industrialized societies, because the assumption was that the modernized societies had "arrived" and that their past was of interest only to show the road to modernity. This theory posits development as economic growth, characterized by increases in the Gross National Product (GNP), industrialization, technology, consumption, parliamentary democracy, and so forth (Unsicker, 1987). The economy is measured through the attainment of a high rate of annual growth of GNP and through a high rate of urban industrialization, usually to the neglect of agriculture and rural development. Achievements in

other non-economic social indicators, such as gains in literacy, schooling, health conditions and services, provision of housing, etc., are considered to be only supplementary to economic indicators of development (Todaro, 1987).

According to Huntington (1976), the process of modernization is characterized as revolutionary (a dramatic shift from tradition to modern), complex, systematic, global, phased, homogenizing, irreversible and progressive. The theory is also interdisciplinary; hence it has been used by sociologists, psychologists, political scientists, economists and social and cultural anthropologists. Although many of the basic doctrines of this paradigm have their roots in ideas expressed before the turn of the century by the great classical sociologist, Emile Durkheim and his predecessors, Compte, Spencer and Tonnies; modernization theory per se did not come to prominence until after the Second World War. Revolutionary changes in global economic and political conditions stimulated intense western interest in the direction and outcome of Third World development programs. As Randey (1985) shrewdly indicates, "underlying political motives may have played an important role in facilitating much of the public and private support for research in this field."

Modernization means different things to different people on different occasions. The concept has been used in at least three senses; as an attribute of history, as a specific historical

transitional process and as a particular development policy in Third World countries (Smith, 1973:61). It is the third meaning which is most relevant in the context of development theory, but the problem is that the three meanings are used as if they are interchangeable.

Modified economic growth theories and models were created to describe the process of accelerated modernization in economically less developed countries and provided the intellectual underpinnings of new national development strategies and new bilateral and multilateral aid policies and programs designed to support them. It was under these modified theories that development came to be defined as "economic growth," to be measured statistically. The educational development strategy that evolved in the 1950s and early 1960s, soon became the handmaiden of this GNP - centered strategy of development.

The general belief by economists was that the rapid expansion of the modern sector would require, in addition to a large infusion of physical capital and modern technology, a greatly increased supply of educated manpower and modern skills. But, these were in short supply in the economically less developed countries of the time and hence created a major bottleneck to economic growth. Therefore, the obvious solution was to import from the west and rapidly expand the modern educational and training models that had proved their worth in the industrially

advanced countries. Unfortunately, the highly academic, urban, and modern-sector-oriented curriculum did not realistically fit the learning needs and life prospects of most rural youngsters in the Third World. After all, the imported educational models alienated the brightest and most motivated children from their rural environment and whetted their appetite for migrating to the city, instead of remaining in the countryside and developing their own community.

Another consideration that social scientists and economists considered was the "trickle down theory" of development which suggested that it was the modern sector of the economically less developed countries' economies that would spearhead their development. The essential features of this theory was formulated by Arthur Lewis (1954), whose argument was that the centre of economic gravity in these countries must "continuously shift towards industry through continuous reallocation of labour from the agricultural to industrial sector. As mentioned in chapter one and two, in Zimbabwe, the colonial government emulated and legitimized this theory by making sure it invested heavily in the modern sector of the economy and neglected the rural areas where the majority of the population lived. The colonialists had no conception of development outside the modern sector. Their assumption was that the whites would raise income levels and benefit the elite, without any concern for those who were not in

production for export. In accordance with this assumption, it was suggested that continued economic growth would be primarily dependent upon the human resources - trained manpower rather than on mere traditional economic inputs of ordinary labour and physical capital.

The principal assumptions of modernization theory often made explicit by those who use this approach are (1) that modernization is a total social process associated with (or subsuming) economic development in terms of the preconditions, concomitants, and consequences of the latter and (2) that this process constitutes a "universal pattern." Obviously among various writers there are differences of emphasis with respect to the meaning of modernization, partly due to its relationship with, or deviation from that most contentious concept --"development." For Lerner (1967:21), modernization is the social process of which development is the economic component, while Apter (1967-69), sees development, modernization and industrialization as terms of decreasing conceptual generality. As evidenced earlier, some writers stress structural aspects while for others "the concept of modernization has to do with a transformation of culture and of personality insofar as it is influenced by culture, rather than of some aspect of social organization or of human ecology" (Stephenson, 1968:265).

The transition from traditional (economically backward) to

modern (economically advanced) society can be treated with a primarily negative emphasis in terms of removing institutional obstacles to development, or with a positive emphasis in terms of creating the cultural environment necessary for development. These two approaches are analytically complementary, but the former tends to rest on an "economic man" postulate, assuming that development will occur once effective incentives are perceived while the latter tends to assume that the necessary motivation has to be instilled in the form of a sufficient level of need for development or a suitably progressive world view.

The cultural, economic and political "ideal-typical" destination envisioned by modernization theorists was presented by Rostow (1962) in his historical analysis of economic development, "Stages of Economic Growth: A Non-Communist Manifesto." In his book, Rostow supports the view of modernization theory that underdevelopment should be:

> attributed to purely internal causes - failure to save, to invest, to innovate - that prevents a nation from achieving "a take-off," the crossing of a critical threshold of growth (Bigo, 1974:15).

He attempts to identify specific historical factors which he believes are crucial in determining higher forms of production and society. In his characterization of the gap between development and under-development, Rostow envisions a unique sequence of five distinct stages through which all states must pass; traditional

society, preconditions for take-off, take-off, the drive to maturity and the age of mass consumption (1962:4).

As Webster (1984:53) points out, these five stages are derived directly from an Eurocentric analysis of the industrial revolution in Britain and mechanically applied to a completely different historical physical and cultural contexts. In addition to the emphasis placed on economic growth as the key process in development, social scientists paid particular attention to the spread of the social, cultural, and political patterns of modernity established by economically more developed countries of the west such as education, political parties and urbanization. The belief was that rapid growth in all these areas would inevitably transform developing nations into "modern" states. In his book Modernization Among Peasants, Everett M. Rogers lists some of the social and cultural obstacles which he saw as standing in the way of development. His list includes; perceived limited good; dependence on and hostility to government; lack of innovativeness; fatalism; limited aspirations, lack of deferred gratifications, limited world-view and low empathy. The modernization approach would see these characteristics as obstacles impeding the process of development.

Many observers of the Third World scene would agree that this depressing picture portrayed by Rogers has some truth in it but what is strange about Rogers' approach is that he seems to think

it of no importance to consider how this state of affairs came about, i.e., its historical causes. On the other hand, many other observers would see these characteristics as being first, the effect of underdevelopment and only then being a means of perpetuation of the situation.

> The co-existence of material luxury for the few and appalling misery for the many is not due, the apologists of capitalism assert, to any organization relation between the two sets of phenomena, but rather to the existence among poor peoples of some cultural and social obstacles which have been successfully swept aside elsewhere by the march of progress (O'Brien, 1976:539).

As we shall see later in this chapter, the "dependency school of thought" would not deny the existence of impeding factors in the culture, both social and geographical, of the "underdeveloped" countries, what Amilcar Cabral has called "weakness of culture." But, they would have us realize that these co-exist with characteristics and attitudes among peasants which are the direct result of the socio-economic and cultural distegration of colonized societies by the colonial powers. This in turn, gives new impetus to a fundamental debate over the courses of development cf underdevelopment and to the extent to which investing in people is a necessary concomitant of growth toward a human-centered development approach.

Education and Human Resources Development: The Human Capital Approach

A prominent feature of deliberate progress in modernization is an emphasis on formal education. Students of socio-economic development emphasize education as an agent of change that develops human capital, influences the formation of elites, and modernizes attitudes and behaviour in the general population. Economists and government officials have emphasized that education can produce the knowledge and skills required for economic development. Thus, a consistent theme contained in the human capital literature is that accelerated development depends upon enlargement of the supply of educated manpower which, in turn, depends upon a broadening of access to a formal education system.

The causal relationship between education and development became accepted by academics and policy-makers in the latter 1950s and early 1960s. Supported by the publications and funding programs of OECD and UNESCO, education came to be viewed almost without question as an important, and indeed, "crucial" agent for the rapid economic growth of nations (Fargalind and Saha, 1983).

The argument for human-centered development is that people are both the end and the means of development. Although improved health, nutrition, and education are ends in themselves, healthy and educated human beings are also the principal means of achieving development because they are more economically productive. Family planning, for example, is more accepted when

overall mortality is relatively low and levels of education relatively high. Also, educated and healthy parents are the most likely to have educated and healthy children. Similarly, raising educational levels enhances agricultural farm output and contributes to the effectiveness of agricultural extension and, therefore to food security.

The theoretical framework most responsible for the wholesale adoption of education and development policies has come to be known as human capital theory. Based upon the work of economists such as Schultz (1961), Denison (1962) and Becker (1964), human capital theory rests on the assumption that formal education is highly instrumental and even necessary to improve the productive capacity of a population. Human capital theorists argued that an educated population is a productive population. The emphasis of this theory is on the development of knowledge, skills and capabilities to improve the state of societal economic progress. The task of translating this theory into practice in economically less developed countries was strongly influenced by the work of economists such as Mark Blaug (1984), F. Harbison (1964), C. Meyers (1964) and M.J.Bowman (1968). According to Mutua, (1975), Sheffield (1980), and Sifuna (1980) Human Capital theory suggests that the nations of the Third World were poor not because of the internal and external economic relations, but because of internal and external characteristics, most notably, their lack of human

capital. As with the poor within advanced countries, nothing in the situation of the Third World countries called for radical structural change; development was possible if only they could improve the quality of their woefully inadequate human resources.

The proponents of this school of thought argued that increasing productivity, industrialization and economic well-being in Western countries was connected with rising levels of education and an increasingly qualified pool of manpower. Hence economically less developed countries, lacking in the "knowledge and superior techniques of production" should be provided with aid and technical assistance to increase the quality of their human capital, which would result in their achieving self-sustaining growth (Cheru, F., 1987).

As with modernization theory, human capital theory provided a basic justification for large public expenditure on education both in economically developed and economically less developed nations. The theory was consistent with the ideologies of democracy and liberal progressivism found in most Western societies. Therefore, both theories attributed the sources of underdevelopment or economic stagnation to factors within countries themselves rather than to factors outside the countries. For individuals, such investment was seen to provide returns in the form of individual economic success and achievement (Karabel and Halsey, 1977; Blaug, 1970, 1976).

In their well known study, Education Manpower and Economic Growth, Harbison and Meyers (1964) stressed the point that the appraisal of human capital is a logical starting point for analysis of growth and modernization in economically less developed countries. They argue that education, in addition to being a form of consumption, is also an individually and socially productive investment which contributes to economic growth.

This approach to development was echoed in African countries in the years immediately after independence and, to a large extent, accounts for the rapid expansion of higher education in the 1960s (Ginzberg, E. 1969). The result of such expansion has been ever-burgeoning educational budgets in most developing countries. It is estimated that, on the average, 16 percent of the national budgets of developing countries are now being spent on education. Between 1960 and 1970, the annual growth rate in educational expenditure was 14.3 percent in Asia, 16 percent in Africa, and 20 percent in Latin America (Commonwealth Secretariat Statistics, 1975).

Considerable evidence also indicates that education raises the farm output of farmers. For instance, studies in Korea, Malaysia, Nepal, and Thailand demonstrate that education increases the physical farm output of farmers and that the effects of education on crop yields and other physical measures of farm output are "positive, statistically significant and quantitatively

important" (Jamieson and Lau, 1982:8). Four years of schooling, on the average, appears to increase the output of farmers by 8 percent (Psacharopolous and Woodhall, 1985). Similarly, Jamieson and Lau (1982:8), using estimates of rates of return to rural education in Korea, Malaysia, and Thailand confirm that education is a profitable investment. For example, a calculation of the returns to a World Bank education project in Thailand, suggests a rate of return of at least 20 percent.

When the relationships between education and other ways of boosting agricultural farm output are taken into account, the economic justification of investing in education in rural areas is strengthened even further. Schultz's (1964) hypothesis suggests that education will be more effective in a changing modernizing environment than in a traditional one, especially when the effects of education on farmers' efficiency in traditional environments (characterized by traditional technology, farming practices and crops, plus little reported innovation or exposure to new methods), are compared with the effects in a modern environment. In support of this fact Jamieson and Lau (1982:30) said that the effects of education are substantially greater in the modern environment as can be seen from the mean increase in output after four years of education. It is 1.3 percent in traditional conditions and 9.5 percent in modern or modernizing conditions.

When Jamieson and Lau (1980) and Lockheed, Jamieson and Lau

(1980) examined the relationship between the educational level of farmers and their farm output, they produced solid evidence for the positive effects of education on production, productivity and farmers' income. Most writers argue that the process by which education makes its impact, is by better allocation of resources (allocative efficiency). This argument holds that better educated farmers make better choice of inputs, combine them more effectively and judge the appropriate quantity better. According to Ram (1980), this allocative efficiency is due to the fact that education reduces the marginal cost of information (i.e. information that is most useful in selecting the most productive combination) and therefore increases the marginal benefits of such information. The reasoning here is that educated farmers are better at making overall judgments and are more open to innovations.

From the literature reviewed in this study there seems to be a two-way relationship between education and other investments to improve agricultural farm output. The relationship of education on farmers' output is considerably greater when complementary inputs such as fertilizers or new types of seed are available. Concurrently, education, particularly literacy and numeracy, is often a prerequisite for the introduction of modern farming methods that rely on fertilizers and new types of seed (Perraton, 1983:75).

There is also evidence that formal education of farmers may improve the effectivness of investment in agricultural extension services. Therefore, formal and non-formal education, including agricultural extension services, complement each other. Other studies by Baldya, Chou, Jamieson, Moock and Shrestha (1980), Hong (1975) and Lockheed, Jamieson, Lau (1980) also tend to confirm that education and extension services are complements for one another rather than substitutes.

By the early 1970s it was becoming apparent that despite development programs premised on modernization and human capital theory, the expected outcomes were not being realized. Disparity between rich and poor, insufficient food production, massive rural-urban migration, unemployment of the educated, overpopulation were increasingly, not less, problematic in most less developed countries. Even in developed countries the expectations of human capital theory were not being realized. From the recognition of these failings came a critique, most often a neo-Marxist one which in the case of less developed countries focussed on dependency or the development of underdevelopment.

Education and Development: Radical and Neo-Marxist - Dependency Approach - A Critique

Of all the possible criticisms levelled at human capital theory there is one which both strikes at the heart of its economic analysis and invites sociological alternatives. The

principle of marginal productivity which underlies human capital theory, is perhaps the key to its criticism. In other words, when the human capital approach failed to deliver the expected outcomes as noted earlier, Neo-Marxist theorists came forward with explanations for the failure.

Fargalind and Saha (1983) and many other writers have noted that the most outstanding challenge to the education and development hypothesis has come from radical and neo-Marxist camps. They point out that these Radical and Neo-Marxists writers are in general agreement concerning their rejection of development theory derived from evolutionary, structural, functional and modernization perspectives. They therefore, represent departures from the linear models of social change in that the current situation in most economically less developed countries is not seen as an "original state," soon to follow and imitate the paths of already developed societies, but the result of many centuries of decline, due to a process of dependency and underdevelopment. In other words, development - underdevelopment is a relationship, basically one of "dependence" - hence its other name given to this school of thought" the "Dependency Theory." The relationship between the advanced countries and those of the Third World is an exploitative one, and the dependence which it fosters:

> in chain-like fashion extends the capitalist world and the national metropolises to the regional centres...and from there to local

> centres...to large landowners or merchants ...who expropriate surplus from small peasants.... Thus the capitalist system generates economic development for the few and underdevelopment for the many (Frank, 1967:6-8).

In contrast to evolutionary and modernization theories, dependency theory focuses upon the relationships both between and within societies in regards to social, cultural, political and economic structures. It has been said that "Europe did not "discover" the underdeveloped countries, rather it "created" them (T. Dos Santos in Bernstein, 1973:74). This remark can perhaps serve to sum up the analysis of this school of thought. Writers of this persuasion help us to see Third World countries as part of a world-wide system of economic and social relationships. Underdevelopment arises from a world-wide situation which is to be explained in the light of the expansion of capitalism (R. Dos Santos in Bernstein, 1973:74).

Underdevelopment is therefore not just a phenomenon which we can observe and describe in terms of its characteristics: poverty, urban drift and so forth; it is a situation which has historical causes. It is an inevitable consequence of the way the western nations came into contact with the Third World countries. It is a process which dates from the first contact of these two worlds; the first slavers, the first traders, the first missionaries initiated the process.

This explanation of underdevelopment would have us see that the backward situation in Third World countries is directly due in large measure to the exploitation of these countries, initially by more "advanced" nations in their colonizing movement of expansion and more recently by international capital in the form of multinational companies and internal elites. Therefore, one would argue that the development of the West on the one hand and the underdevelopment of the Third World on the other are only two sides of the same coin.

Some thinkers and planners, not of this school of thought, would see little use in reflecting on the colonial era and its effects, holding that the past is past and there are tasks to be faced in the present which are so pressing that there is not time for backward-gazing. For the "Dependency" school of thought, on the contrary, the historical analytical approach is essential. Szentes points out that:

> It is impossible to bring about a deliberate and purposeful change in the present without knowing how this present state came about. We can't successfully fight any phenomenon without knowing its roots (Szentes, 1971:17).

According to Rodney (1971), an indispensible component of modern underdevelopment is that it expresses a particular relationship of exploitation; namely the exploitation of one country by another. He goes on to argue that all of the countries named as "underdeveloped" in the world are exploited by others; and the

underdevelopment with which the world is now preoccupied is a product of capitalist imperialist and colonial exploitation. In his argument he stresses that African and Asian societies were developing independently until they were taken over directly or indirectly by the capitalist powers. When that happened, exploitation increased and the export of surplus ensured depriving the societies of the benefit of new natural resources and labour. That, he says, is an integral part of underdevelopment in the contemporary sense.

A.G. Frank, shares this line of thought together with Samir Amin, Emanuel, Cardosa, Faletto, Dos Santos, etc. Thus education alone in these circumstances cannot sustain economic growth since it tends to be elitist in nature and caters for those in power, economically and technologically. These radical views in connection with education have become persuasive and influential. In many respects their critiques of education and development incorporate and are part of a larger movement in sociology generally, where structural functional and consensus approaches have been rejected in favour of conflict and sometimes micro-oriented perspectives (Karabel and Halsey, 1977). In view of this, the neo-Marxist critique becomes crucial in terms of focusing on societies with capitalist economies and on the world system rather than on particular nation-states considered independently of others. Consequently, it then becomes impossible to assess the

role of education in development or farm output in Third world societies without an international and national perspective respectively. In other words, according to neo-Marxism, the crucial unit of analysis is the world system made up of networks of relations between countries in which some countries are dominant while others are subordinate. As such, education, like manufactured goods, is seen both in terms of domestic and international consumption. According to Fargalind and Saha (1983), the important question to ask here is not: "How does education contribute to social and economic development?", but rather, "What kind of education is appropriate for what kind of development, and in whose interests?"

Neo-Marxists, agree that education can contribute to economic growth. They contend that this growth in advanced capitalist societies has mainly served the interest of those in power and has perpetuated the inequalities of the social system. Also, Bowles and Gintis (1976) contend that schools reinforce and reproduce the class structure of capitalist society by producing a docile and compliant work force. They say that there is a "correspondence" between school and the work place.

For instance, schooling in most former colonies of Africa, Latin America and South Asia was imported from Western industrialized societies and has served the same dominant social groups as did the colonial system. Carnoy (1974) argues that

schools in many economically less developed countries are simply a form of neo-imperialism and neo-colonialism. According to dependency theories, schools in these instances continue to serve the interest of the "core countries." This is so, due to the fact that the leaders or the elites of the poor countries hold attitudes, values and interests consistent with those in the rich countries.

Following Szentes, the main qualitative features and causes of underdevelopment in nations can be listed as follows:

1. Economic dependence on foreign capital.
2. The draining of the national economy out of the country.
3. A disintegration of the traditional national economy.
4. A "dual" structure of the society; the over-privilege of the urban sector at the expense of the rural areas and peri-urban areas.

Rather than seeing education as an engine of economic growth and development as the human capital theorists do or as a prerequisite to development as the modernization theorists do, dependency theorists see educational practices as a product and perpetuator of particular economic and political systems. Despite this view, dependency theorists do acknowledge that economic and political changes must be accompanied by changes in educational practices including more equitable access to education, education and training appropriate to the society, less emphasis on formal,

particularly tertiary education and so on. They would also acknowledge with Todaro (1989:20, 128) that although it is extremely difficult to document statistically, it seems clear that the expansion of educational opportunities at all levels has probably contributed to aggregate economic growth. He further argues that even if alternative investments in the economy would have generated growth, this would not detract from the important contributions, non-economic as well as economic, that education can make and has made to promoting aggregate economic growth. Todaro concludes his argument by saying that the fact that an educated and skilled labour force is a necessary condition of sustained economic growth cannot be denied.

When one examines the relationships between education and farmers' farm output, the more educated tend to produce more as peasant farmers (Lockheed, Jamieson and Lau, 1978). However, there are sharp limits to what education can do in isolation. Learning improved techniques of cultivation which depend upon state land reforms, is of little value if the power structure makes any land reform impossible. Therefore, the effects of educating adults for increased farm output, need to be assessed within the political framework of the country concerned since education is seldom the prime mover. Where education is working against the grain of its host society, we cannot expect it to cut sharply through the major problems faced by peasants who have never been to school. The

following section discusses the relationship between education and farm output.

EDUCATION AND FARM OUTPUT IN ECONOMICALLY MORE DEVELOPED COUNTRIES

In economically more developed countries, authors like Schultz (1964, 1974, 1975), and Griliches (1963) challenged the traditional view of education as not contributing to farm output by examining the relationship between education and farm output in the United States and found that there is a positive relationship between education and farm output. The initial serious attempt to measure the effect of education on a farmer's farm output was made by Griliches (1963a) in the United States. He used the data from sixty-eight regions for the year 1949 and estimated an aggregated production function. Later he extended the same study using state averages for the years 1949, 1954 and 1956 as his units of observation (Griliches, 1964). His study, which found the rate of return to social investment in agricultural research and extension to be about 300 percent, emphasized the importance of education, research and extension for increasing farm output. According to the human capital theory, education improves the quality of labour and this was considered by Griliches as essentially the ability of farmers to produce more, given the same resources other than labour. This quality of labour was termed as the "worker effect" by Welch (1970).

Nguyenh (1979) tested the stability of the agricultural

output function over time using the 1950, 1955, 1965, 1970 and 1975 inter-country-cross-section sample including LDCs. In his study, the effect of secondary level education showed a positive role in increasing agricultural farm output. The general conclusion drawn by economists from studies at the state level of aggregation in the United States, developed countries and developing countries comparatively, is that schooling can be an important source of increased farm output. That is, the main importance of schooling is in its effect on farmers' output in both MDCs and LDCs.

Many researchers have emphasized the importance of education for increased farm output in a modernizing environment. Nelson and Phelps (1966) are two economists who have suggested a way in which education might affect farm output and diffusion of technology. They pointed out the likelihood that at any given time there will exist a "gap" between the technology available and the portion of that technology actually in use and suggested that if education expands the ability of an individual to adapt to changing conditions, then the contribution of education to farm output would be related to the rate of technological change and to the size of the technological gap (pp. 67-76). The innovative effect of education considered by Nelson and Phelps was later incorporated in the concept of the "allocative effect" discussed by Welch (1970).

Nelson and Phelps' hypothesize that education serves to augment skills in allocating resources in the environment in which information is scarce or expensive to acquire, namely in the situation of change, for example, modernization. This hypothesis has received support mainly from the empirical studies of the United States agriculture (Schultz, 1975). This literature indicates that schooling acts as a catalyst in behavioral change that is conducive to economic growth. The importance of education in agricultural output, especially for the undeveloped countries was also noted by Chaudhri (1974, p. 374) who specified five aspects or reasons why a farmer's education becomes relevant. He contends that education enables farmers: to acquire the ability to decode new information - know what, why, where, when and how; to evaluate costs and benefits of alternative sources of economically useful information; to establish quick access to newly available economically useful information; to choose optimum combinations of crops, new inputs and agricultural practices with the least number of trials, and to perform agricultural operations more effectively in the economic sense, i.e, the ability to produce more from the given amount of inputs.

Chaudri (1974), like many other authors, refers to a farmer's "allocative effect" that education affects a farmer's ability to choose the optimum combination of crops, new inputs etc. In terms of an individual's production or technical efficiency, the effect

of education as indicated earlier is what Chaudhri referred to as the "worker effect." He maintained that education would enhance agricultural output via both the "worker effect" and "allocative effect." Although Chaudhri first proposed and tried to measure the "allocative" and "worker" effects of education in agriculture in 1968, his work did not receive the wide discussion that Finis Welch's (1970) work later had. It was Welch's analysis of this subject and the dissemination of this work that opened a whole new area of research. Studies have been conducted both in MDCs and LDCs on the "allocative and worker effects" of education.

Agriculture in MDCs is in a state of disequilibrium, constantly exposed to a changing environment. Harker (1973) has shown, on the basis of a Japanese sample, that the better educated the farmer is the more actively he seeks additional knowledge. He also noted that graduates of agricultural schools made more use of the services of extension agents than did graduates of non-vocational schools. Lee (1970) also found the same in the case of a Korean sample, although Coughenor (1960) came to a slightly different conclusion that the better educated farmers are, the more they tend to supplement their knowledge from written materials rather than by consultation with extension agents.

While Huffman, Khaldi, and Fane focused on the allocative effect of education, Muller (1974) focused on the "worker" or "technical" efficiency and found that there was a positive

relationship between the "worker's" education and his output. Unlike these studies of agricultural farmers, Muller's work used a sample of California dairy farms to argue that not only education but familiarity of managers with information sources, enables them to improve output. He developed a model to show that output differences between firms occur due to the differences in non-conventional inputs especially information or knowledge which influence the firms' ability to use its available technology set fully. Apart from the research conducted in the United States, and Japan, a number of studies have been carried out in less developed countries, that have dealt with the relationship between education and farm output.

EDUCATION AND FARM OUTPUT IN ECONOMICALLY LESS DEVELOPED COUNTRIES

As in economically more developed countries, agriculture in less developed countries is also in a state of dynamic change. However, the degree of "modernization" varies, not only among these countries, but within each country with differences from one region or area to another.

Scott (1976:vii), studied peasant economy in Southeast Asia, focusing on the following questions: (1) Why do peasants prefer to avoid economic disaster rather than take risks to maximize their average income?; and (2) What are the peasants' conceptions of social justice of rights and obligations of reciprocity? Also, in similar studies by Cohen and Hutton (1979:105-107; 114-115; 118,

and 124-125), the main question was: What factors are involved in resistance behaviour and how much behaviour change comes about with education and innovations?

Both Cohen and Hutton noted that the general themes of resistance to change in rural areas, and peasant conservatism have been widely discussed by different sociologists and three different approaches to the question may be distinguished: in the tradition of structural functionalist sociology are those authors who assume that peasant conservatism is a product of a particular type of traditional rural value system. Familistic and other collective norms, superstition, and other related elements in the value system are seen as fundamentally impeding socio-economic progress and modernization. Other authors have taken less for granted, and have shown, often through detailed empirical work, that peasants, far from being in some primeval state of traditionalism have good reasons to resist specific developments. These reasons may well come from peasants forming their own economic judgments or from defining goals in terms of socially-desirable goods and rewards rather than material ones. Where judgments of alternative economic strategies are made by the peasant, it need not be assumed that these are less "modern" than those of the planner, whose views may indeed be as traditional as those of anybody else; diverse studies also exist which show that peasants frequently respond to economic opportunities in a profit-

oriented and calculating manner, but that these responses are set in actual situations that are themselves rather complex both for the actor and the social scientist, and the responses are not easily classified as either impeding or facilitating progress.

The importance of education for agricultural farm output also emerges from the World Bank studies. One such recent study is that of Jamieson and Moock (1984) who examined the extent to which the cognitive outcomes of education mediate between the education that individuals receive and their subsequent efficiency as farm operators. Using a sample of 683 households obtained from the Terai region of Nepal for the agricultural year 1977-78, the researchers tested the effect of education on efficiency of three major crops: early paddy, late paddy and a recently introduced wheat crop.

The study found that farmer education in Nepal had a positive effect on the efficiency with which farmers grew three crops. It had a statistically significant relationship with increased efficiency in wheat production even after controlling for farmer's family background, measure of ability and size of holdings. Among the cognitive outcomes of education, numeracy (the score was based on the answers farmers gave to 14 arithmetic problems) was found to affect output in wheat production as well as the propensity to grow wheat at all. The completion of seven or more years of schooling had a positive effect on the technical efficiency of

farmers, increasing crop output by about 31% whereas the completion of fewer than seven years had no effect. Since the evidence showed a definite effect of educational attainment and numeracy on farm output for the recently introduced wheat crop and relatively weak effect on the familiar traditional paddy crop, the findings are consistent with Schultz's (1975) hypothesis that education is of value only in a changing environment. The effect of education is thus twofold; a direct effect, in that it improves the individual farmer's judgement in the choice of the optimal combination of inputs, and an indirect effect, by improving the individual's ability to obtain access to information pertinent to the choice of this optimal combination. On this basis, education and agricultural extension could be regarded as complementary, based on the fact that educated farmers are more active than the others in seeking information they can obtain from extension services. According to Lele (1977), in the Chilalo Agricultural Development Unit (C.A.D.U.) project in Ethiopia, the best educated farmers benefit most from the extension services. Perraton, Jamieson, Orivel (1981) arrived at the same findings in Malawi that educated farmers are twice as likely to be in contact with extension agents which in turn increases their farm output.

Jamieson and Moock's findings are also consistent with Wu's (1977) results emphasizing that six years of schooling is a threshold and therefore, individuals who complete less than six

years of education do not retain enough learning to benefit from it later as farmers. The level of education essential to improve farmer efficiency and farm output, seems to vary from one country to another. While six years in Taiwan (Wu:1977), and seven years in Nepal (Jamieson, Moock:1984) are determined as the threshold, in Kenya it is three years (Mook:1981).

A major and most recent contribution made to this subject is by Lockheed et al. (1980) and Jamieson and Lau (1982) who provide a comprehensive synthesis of eighteen individual studies conducted in thirteen low income African, Asian, European and Latin American countries. The researchers analyzed the thirty-seven data sets collected over a period of twelve years. These surveys contained data from each farm on some or all of the following variables: total output of the farm, land area under cultivation, person-days of family labour used, quantity and kind of equipment used, educational levels of the members of the household and exposure of the farmer to extension services. Using this type of data, they assessed the effect of education on output estimating a production function relating quantity of farm output (measured either by crop yield or crop yield value) to the level of each input including farmer's education.

The analysis showed a broad range of findings among the diverse studies. In six of the data sets, education had a negative, but statistically insignificant effect on farm output,

while in the remaining thirty-one cases, the effect was positive and usually significant. The overall conclusions of the study was that farm output increased on an average of 8.7% with a standard deviation of 9% as a result of a farmer having four years of primary education compared with no schooling. When the data were weighted for reliability across tests, the average gain fell slightly to 7.4% with a standard deviation of 6.8%. This means that the increase was 1.85% per school year.

Since this thesis focuses on Zimbabwe, it is necessary to examine the limited literature available on education and agricultural output in this country.

EDUCATION AND FARM OUTPUT IN ZIMBABWE

As in both economically developed and economically less developed countries, Zimbabwe has three major forms of agricultural production. The first and most traditional is the pure, low output subsistence farm. The second form is what might be called "diversified" or "mixed" agriculture, where part of the produce is grown for self-consumption and part for sale to the commercial sector. Finally, the third form represents the large "modern" farm, exclusively engaged in high-productivity, "specialized" agriculture geared to the commercial market.

Agricultural modernization in mixed market developing economies may be described in terms of the gradual but sustained

transition from subsistence to specialized production, (Todaro, M.P., 1985). Indeed, Zimbabwe, and in particular the Model "C" Resettlement Schemes under study, is an example of a stage: the farmers are in transition from subsistence to specialized production. Consequently, such a transition from subsistence to specialized "contractual" and modernized production taking place in these schemes, involves much more than reorganizing the structure of the family farm economy or applying new agricultural technologies. In addition to adapting the farm structure to meet the demand for increased farm output, it involves, profound changes which affect the farm families' social, political and institutional structure.

Bembridge, T.J. (1979) studied sociological and technological problems in the Zimbabwean province of Matabelelands African Purchase Land areas. He studied these areas in an attempt to plan more objective extension programs and strategies, and concluded that low education standards, high use of farmers' large family size, lack of short and medium term credit facilities, low rates of adoption of new practices and non-viable farming units are all constraints towards efficient farming, high agricultural output and higher living standards. Although Bembridge's study identifies some problems that could affect farm output in Zimbabwe, he does not study productivity itself.

Jansma (1979:49) in examining constraints to increased

agricultural output in nine countries in Southern Africa,- Angola, Botswana, Lesotho, Malawi, Mozambique, Zambia, Swaziland, Zambia and Zimbabwe, - came up with the following list of constraints; lack of trained personnel, lack of education among the rural peasant farmers, the use of traditional farming methods and inadequate infrastructure and transportation.

In view of the fact that during the colonial rule in Zimbabwe, the majority of the current peasant adult farmers or farm families were not able to get basic primary education, there are problems in the communication of innovations among farmers. The extension agent operates in a situation where a large number of factors can influence his/her communication of technical information to the illiterate farmer as well as the adoption of improved techniques and practices by farmers.

According to a 1986 study reported in a Zimbabwean Chibero Agricultural Colleges' publication on "Appropriate Education for African Agricultural Development," Zimbabwe was presented as one of the countries which has escaped food crisis. The reasons for the success of agriculture in Zimbabwe was shown to be social, economic, political and educational. The paper then concentrated on the educational factors where the Zimbabwean Government's policy of giving priority to education and popularizing agriculture, pursued through strategies of reconciliation and rural reconstruction, has succeeded.

The purpose of this literature review has been to take a comprehensive view of the available information on the relationship of education to national development and further examine the extent to which this relates to farmers' education and their farm output. Its aim was to provide some theoretical orientations and evidence from developed and less developed countries that farm output can be influenced by investing in people through formal, informal and non-formal education and providing adequate modernized facilities to farmers despite their dependency on the state. The review examined several studies by different researchers on the effects of educational level of farmers and their farm output, which demonstrated a positive, significant, and consistent relationship.

RESEARCH QUESTIONS

As a guide to the field research carried out on this study, the following nine research questions were used.

1. Whose formal education in a farmer's family is important for increased farm output?
2. Do farmers who use information from agricultural extension officers and attend agricultural extension courses realize high farm output?
3. Does farmers' age and that of his/her family members have any relationship with farm output?
4. Does the number of people living in a farmer's family have any effect on a farmer's output?

5. Is a farmer's previous farming, dairy or irrigation experience important for increased farm output?

6. Do farmers who have longer experience in the scheme realize improved farm output?

7. Do farmers who frequently obtain farming information from the radio and agricultural publications realize high farm output?

8. Is there any relationship between a farmer's use of a particular cowbreed and increased milk output?

9. Can a farmer's exposure to non-formal and informal education factors substitute or supplement for his/her formal education in order to realize increased farm output?

CHAPTER IV

RESEARCH DESIGN AND METHODOLOGY

INTRODUCTION

This chapter describes the research design for the study, focusing on the procedure, the population, methodology, procedure for obtaining data, data sources, interview techniques, and analysis of data.

RESEARCH PROCEDURE

The central purpose of the study was to examine the relationship between the levels of education for the individual farmers (including their family members) and their farm output levels to see if and how education (formal, informal and non-formal) has contributed to the efficiency of their farm output. The problem was analyzed from the perspective of the levels of formal education for the individual farmers, farmers' exposure to the available informal and non-formal education, the levels of their farm output and their ability to read, write and count, by working out calculations related to farm output in order to see if education had contributed to their farm output.

The traditional "treatment and control" design was found to be impracticable because most of the independent variables influencing farmers' farm output are prescribed by the state through the administering agent A.D.A. Also, Herbert's design,

which utilizes direct observation of farmers' performance along with other sources of data, was not used due to anticipated insurmountable constraints of distance, time and finances. For these reasons, a self administered interview schedule as the principal instrument of data collection was adopted (see Appendices A, B, and C).

This study sought to examine the relationship between formal, informal and non-formal education, including agricultural extension education, and the variations in the farmers' farm output of cotton, wheat and milk. Primary data were obtained from farmer respondents and from official production records which were used to check farmers' self reports of farm output.

THE POPULATION

The population for the study consisted of: A sample group of 248 farmers at Middle Sabi and Rusitu Resettlement Schemes, who gave the primary data for this study. The other source of data which was mostly complimentary to the data from farmers was obtained from:

(a) The 13 extension officers at the two schemes, who also gave the data from official records for this study.

(b) The 5 supervisors (heads of departments) of the Agricultural Development Authority (A.D.A.) - whose information was helpful in formulating and focussing the

study.

(c) The 4 senior administrators (head of departments) of Ministries of Education; Lands, Agriculture and Rural Resettlement, whose information was also as (b) above.

(a) Settler Farmers at Middle Sabi and Rusitu Resettlement Schemes

This group of respondents was made up of the irrigation and dairy farmers who are settler farmers at the two Model "C" Resettlement Schemes. In total, 248 respondents were interviewed. They were distributed in the following manner:

Middle Sabi Stage IIIA	43
Rusitu Small-Scale Dairy	205
TOTAL	248

The selection of this group of settler farmers as the main target for the study was made on the assumption that their farming activities represent a comparable cross section of activities to more similar schemes. At Middle Sabi, all the 43 settler farmers were interviewed and at Rusitu, about sixty percent of the total number of settler farmers were randomly selected from each geographical area of the scheme. Therefore, 205 settler farmers out of 348 were interviewed.

(b) Extension Officers, Heads of Departments for A.D.A., Ministries of Education; Lands, Agriculture and Rural Resettlement

Information gathered from Extension Officers was mostly through informal discussions about the farming activities in their

respective schemes, farmers' performance and their official farm output records for the farmers. Extension officers are the decision-making machinery at their respective schemes. They are, therefore, by virtue of their positions, supposed to be well versed in the goals and the day-to-day running of the schemes. There is one extension officer at Middle Sabi and twelve at Rusitu. Information about the administration and policy on Model "C" Resettlement Schemes was obtained from A.D.A. Heads of Departments and Senior Administrators of Ministries of Education; Lands, Agriculture and Rural Resettlement.

A.D.A. is responsible for the administration of all state farming including the small-scale farmers in Model "C" Resettlement Schemes. Ministries are responsible for policy-making and policy documents.

DATA GATHERING TECHNIQUES

The study utilized two main methods of collecting data: interview survey and documentation methods. Most of the data is based on primary data obtained from farmers in the selected two Model "C" Resettlement Schemes through interviews.

A structured interview process was used to collect data. To a limited degree the study used the "standard open-ended questions" in which case the respondent was asked to provide his or her own answer to the question. But, mostly, the "general interview guide

approach" was used (Patton, 1980, p. 197). In the later approach, "closed-ended" questions, where the respondent was asked to select an answer from among a list provided by the researcher was used. Closed-ended questions were used because the questions provided a greater uniformity of responses and are more easily processed. Also, because several interviewers were used, closed-ended questions standardized interviews. Permission was obtained from each respondent to interview him or her with confidentiality guaranteed. Prior to interviewing each farmer, interviewers explained the purpose of the study, the importance of farmer's participation by giving the required information and that none of their names was going to appear in the report. Having assured farmers of the confidentiality, they felt confident to answer questions. Also illiterate farmers were able to participate freely without having to write any information.

For this study, the interview survey method was used to collect data from the farmers rather than asking respondents to read questionnaires and enter their own answers as in the case with the "self-administered questionnaires" method. Questions were asked orally and respondents' answers were recorded by the interviewer. This method was chosen out of concern that some respondents might lack the requisite literacy skills. Also, the presence of the interviewers generally decreases the number of "don't knows" and "no answers". In order to further non-responses,

interviewers were instructed to probe for answers.

Face to face interviews with farmers or plot holders were conducted using a pre-designed interview schedule. The strategy for conducting the interviews involved meeting with the individual plot holders at specified times and at central venues within their respective schemes. The survey instrument included questions on farm/plot output and the factors which influence farm output. The farm output data covered the farming period 1984/85 to 1988/89 (a five year period).

Since most interview surveys of this scale require more than one interviewer, the Agricultural Development Authority provided the researcher with two assistants. Within the context of the interview schedule, all the interviewers observed as well as asked questions. A good example of this is when the interviewers asked the age of the respondents.

The information from policy and implementation documents supplemented primary data obtained from interviewing the farmers. A journal was also maintained to note any problems the researcher faced in the field work or other concerns that could have risen in the course of interviews with farmers. The data gathering interview schedule was divided into five sections. Each section covered one aspect of the study (see Appendices A, B, and C).

Section one consisted of questions relating to socio-economic background characteristics of the respondents namely,

wives'/husbands' education, childrens' education, income, number of family members etc. This gave the socio-economic background of the farmer's family.

Section two was concerned with the respondent's education. This section was then subdivided into three parts. Part "A" dealt with questions relating to formal education level, reading, writing and calculation skills. Part "B" dealt with questions relating to practical experience with the farming system being used, and exposure to TV and/or radio programs on agriculture as well as influence of neighbor farmers. Part "C" dealt with non-formal education, i.e. contact and interaction of farmers with extension officers and agricultural training courses attended concerning their farming activities.

Section three consisted of questions relating to tangible inputs used by the respondents. This section was also subdivided into seven parts with each part dealing with questions relating to quantity and quality of seed, insecticides, pesticides, fertilizers, irrigation, tillage power and labour. Though all these variables are prescribed within a scheme, the questions were designed as a check to farmers' compliance on recommendations and literacy skills to follow prescribed information.

Section four consisted of questions concerned with work and dealt with crops cultivated, crops and milk yields from 1984/85 to 1988/89, type of dairy cows, income generated from these farming

activities.

Section five dealt with questions relating to the availability of credit/money - to buy inputs, pay labour etc., and services from the administering agents.

(a) Validation and Reliability of the Research Instrument

Validity is the extent to which an instrument measures what it purports to measure (Mouly, 1970:116). In conventional usage, the term 'validity' refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration (Babbie, E. 1986:112). Independent information on yields and inputs of fertilizers, seed, insecticides, pesticides, herbicides, irrigation cycles, tillage power, cowbreed etc. constituted checks on reliability and validity.

Reliability, however, does not ensure accuracy any more than precision does. According to researchers, like Mouly (1970) and Dressel (1976), a reliable instrument should be able to reproduce a set of measurements over time or different test settings. In this study, it was not possible to apply procedures frequently adopted to test the reliability of research instruments--"test-retest" procedure, and "equivalent test" procedure (Treece and Treece)--due to constraints of distance, time and finance.

PROCEDURE FOR OBTAINING DATA

The Secretary for the Ministry of Lands, Agriculture and

Rural Resettlement (which is the umbrella body for all small scale, large scale commercial farmers, communal farmers and parastatals responsible for state agricultural production and marketing) was contacted through a formal letter requesting permission to have access to the Ministry's documents on Resettlement policies and procedures. Although there was no formal written response from the Ministry, access was permitted when the researcher was carrying out his field work. A copy of the formal letter written to the Secretary is included in Appendix "E" of this study.

Another formal letter of request was written to The General Manager of the Agricultural and Rural Development Authority (A.R.D.A.) requesting permission to carry out the research at Middle Sabi Stage III A and Rusitu Small-Scale Resettlement Schemes; and to have his staff's participation in the study. A.R.D.A. is a parastatal administering the Model "C" Settlement Schemes in Zimbabwe. It is also the umbrella body responsible for all state farming in the country. A letter of response from A.R.D.A., is also included in Appendix "E" of this study. Included in the letter, is a brief description of the nature and purpose of the study as well as a request for permission to collect data from the Authority's Resettlement documents.

DATA ANALYSIS PLAN

Before the field research, a precoded standardized format for analyzing the responses to the closed-ended questions was prepared. In the case of open-ended questions, coding was accomplished only after collection when a preliminary inspection of the data provided the basis for categorization of the data. The researcher examined the various messages or responses "to identify the dimensions or themes that seemed meaningful to the producers of each message." (Berg, 1989:112). Descriptive statistics about the sample including background, inputs and output information are presented in chapter five. They provide a useful overview summary of important characteristics of the sample prior to moving to look at associations between variables. It is particularly important to identify any major characteristics of the sample which may affect, and/or explain the results obtained in subsequent data analysis section.

Chapter five also evaluates the relationship between farmers' formal, informal and non-formal education and their cotton, wheat and milk farm output per hectare and cow respectively. Here, cross-tabulations are used to investigate, for example, such questions as whether having low education (0-8 years in school), high education (9 - high years in school) and exposure to informal and non-formal education, is associated with farm output. Also, the variations in farm output by the same dependent variables are

evaluated by the use of frequencies, regression analysis and simple percentages.

Regression analysis is a method of determining and describing the specific function, relating the relationship between a dependent variable and a set of independent variables. Its use in this study isolates those factors that are most important for the farm output of cotton, wheat and milk. By using multiple regression analysis, the specification of the amount of variation in the dependent variable that can be accounted for by all the independent variables acting together is made possible. Also, a step-wise multiple regression method used in this study determines the increment added by each independent variable. The problems which exist with the regression analysis techniques are that its use for statistical inferences is based on the same assumptions made for correlational analysis; simple random sampling, the absence of non-sampling errors, and continuous interval data. Since social scientific research seldom completely satisfies these assumptions, one should use caution in assessing the results in regression analysis (Babbie, 1986:431).

CHAPTER V

ANALYSIS OF RESULTS: IRRIGATION AND DAIRY FARMERS

INTRODUCTION

This chapter is divided into two sections--Section 1 pertains to the irrigation farmers of the Middle Sabi Resettlement Scheme and Section 2 pertains to the dairy farmers of the Rusitu Resettlement Scheme. Each section begins with a descriptive overview of the farmer's family, educational and farming background, farming practices, use of agricultural, educational and extension services and farm output. This is followed by an analysis that isolates those factors that are most important for farm output.

SECTION 1: THE IRRIGATION FARMERS

The Middle Sabi Resettlement Scheme is a state controlled irrigation scheme where settler farmers grow cotton and wheat annually. Although there is a potential for 47 farmers each with 10 hectares of land, at the time of the interview, there were only 43 farmers in the scheme, each of whom, was interviewed.

Family and Farmer Background

There are few female farmers at Middle Sabi, all but two were male. Similarly, there are few young farmers at Middle Sabi, only 4 (9%) were below age 35. They ranged in age from 29 to 63 years

of age and averaged 44. This age pattern affects both the size of their families and the age of their children. Middle Sabi farmers generally have reasonably large families. Family size including relatives living with them, ranged from 2 to 13 but averaged 7. These family members depending on their age and education have the potential to be a significant source of farm labour as well as a potential source of information if they possess a reasonable amount of education, particularly when the farmer himself has a limited education. Virtually all families had children old enough to help in farming activities. Only 5 (12%) farmers had no children over age 10, the age at which children are likely to become a significant source of labour. As a source of farm labour, 9 (21%) farmers had 1 to 2 children to help and 29 (67%) had 3 to 6 children to help. Spouses also are potential farm workers. All farmers were married, 6 (14%) of them with 2 wives, 1 (2%) with 3 wives, and generally the spouses were younger than the farmers, averaging 35 years of age.

Educational Background

As the earlier discussions of the history of education in Zimbabwe noted, blacks have been at an educational disadvantage to whites, still no farmers at Middle Sabi had less than 5 years of education. More than half, 22 (51%) of the farmers had between 5 and 8 years of formal education and 7 farmers had 11 to 13 years of education with the average being 8 years of formal education.

Based on the earlier review of the literature, it would appear that these farmers are at or above the optimum educational levels. As a complement to the information on years of formal schooling, each farmer was asked a short series of questions designed to assess their numeracy and literacy. All the 43 farmers were able to read, write and calculate with only 3 (7%) farmers making minor errors in their addition, subtraction, multiplication and division problems. In cases where a farmer's own literacy and numeracy skills may be weak, other more educated family members may provide such assistance. For instance, farmers' spouses and their older children over the age of 14 years had between 7 to 13 years of formal education. These more educated family members are above the optimum education levels and are able to provide assistance to farmers with weak literacy and numeracy skills.

Farming Experience

With the exception of one individual who had been a teacher, all the Middle Sabi farmers had farming experience before coming to the resettlement scheme. Almost half (21 or 49%) of them had been small scale commercial farmers. Average equal numbers had been either subsistence farmers (7), farmer employees (7) or extension workers (7). Despite the fact that nearly all had farming experience, the length of that experience varied from two to 25 years. The majority (35) of the farmers also had some prior experience with irrigation though the length of that experience

which averaged 6 years, again ranged from as little as one year to as much as 22. In addition to this prior farming experience, most farmers at Middle Sabi had been involved in that resettlement scheme for a number of years. Only 3 farmers had been in the scheme for less than a year compared to 36 (84%) of the farmers who had 5 to 9 years of experience in the scheme. If experience is a factor in crop yields, these farmers could be expected to be productive ones given both their prior experience and their experience at Middle Sabi.

As was indicated earlier, most farm families at Middle Sabi are large enough to include members who could assist in the activities associated with farm output. There is a widespread usage of family labour during land preparation and planting. On average, whether planting cotton or wheat, three family members assist in this first stage of production. Only three farmers did not use family labour for planting cotton and five did not do so for planting wheat. This involvement of family members is maintained during the growing season, especially for cotton, where only two farmers used no family labour and the average of family members involved rose from 3 to 4. This level of labour rises through the harvest period when an average of 4 family members assist with both the cotton and wheat harvests and when 40 farmers report using family help in picking cotton and 41 farmers report such help bringing in the wheat.

In addition to the labour provided by members of the farmers' immediate family, a number of farmers receive help from other relatives. The assistance of relatives is not as extensive as that of family members but it does follow the same pattern as that for children and spouses increasing from planting through the growing season and the harvest and being greater for cotton than for wheat. In the case of wheat, only 5 (11%) of the farmers report the help of relatives during preparation and planting while 11 receive such help during the growing season and 18 (42%) do so during harvest. The comparable figures are 7 (16%), 18 (42%) and 21 (49%) for cotton crops.

Despite the considerable assistance of family members and other relatives, the farmers of Middle Sabi also make extensive use of hired labour. 33 (76.7%) of the farmers hire help for land preparation and planting of wheat and 36 (84%) do so for cotton. In the case of land preparation and planting, an average of 2 people are hired for both cotton and wheat. During the growing season, an average of 15 people are hired for cotton as compared to only 2 for wheat. Also, an increasing average of 30 people are hired for harvesting cotton as compared to only 10 for wheat. As these figures for the assistance of family members, other relatives and hired labour indicate, these farming activities are labour intensive, cotton especially so.

In addition to the considerable assistance of family members,

relatives and hired labourers, the irrigation farmers plant only the recommended or stipulated crop varieties. The application rates of cotton and wheat seeds, fertilizers, insecticides, pesticides, herbicides per hectare and irrigation cycles are all stipulated for the farmer. Therefore there is very limited deviation from the stipulated rates because the supervision by extension officers during these operations is relatively close or strict. Only one farmer in each case did not report the cotton and wheat seed varieties which they use. An equal number of 4 (9%) farmers for both cotton and wheat reported seed application rates per hectare below the recommendations, and in wheat, only one farmer reported rates above the recommended rates.

As for fertilizer, 13 (30%) farmers reported application rates below the recommendation rates for cotton as compared to 8 (19%) farmers for wheat. Again in both cotton and wheat, one farmer in each case reported rates above the recommended level. At Middle Sabi, insecticides are not used for either cotton or wheat and all farmers responded correctly to the question. An insecticide is an agent used to destroy any of numerous small invertebrate or arthropod animals (insects). However, pesticides are used in both crops, again at a recommended rate. A pesticide is an agent used to destroy pests. Only 3 (5%) farmers reported rates above the recommended rates for cotton as compared to none who deviated from the recommended rates for wheat. In addition,

herbicides are only used if the field of crops is heavily infested with weeds. All farmers reported correct answers to the question. The same trend was reported by all farmers on the frequency of irrigation cycles for cotton and wheat. The average reported irrigation cycles frequency for cotton was 14 times per growing season, and 12 cycles (times) for wheat.

As was indicated earlier in chapter two that the state, through the Agricultural Development Authority (A.D.A.) provides certain services like tillage units at cost to farmers in the Model "C" Resettlement Schemes, farmers at Middle Sabi have an option of hiring tillage units from A.D.A., any neighbouring commercial farmers or purchasing their own units. Only 17 (40%) farmers hired tillage units from A.D.A. while 26 (60%) farmers hired from private commercial farmers in their neighbourhood. These tillage units are used for either ploughing, discing or ripping. The majority of farmers - 42 (87%) reported that they disc their lands as compared to only one farmer who rips his/her land.

Cotton and Wheat Farm Outputs

As the earlier discussions on the purpose of this thesis noted, the aim is to see whether there is any relationship between farmers' formal, informal and non-formal education and their farm output.

In this case, the aim was to see the variations or average in

the farmers' farm output over a period of 5 years (1985-1989) and then find out which independent variables influenced the pattern of their farm output. In this study, farm output is the dependent variable.

(1) Cotton

As might be expected, cotton farm output at Middle Sabi has fluctuated over the five years from 1984/85 to 1988/89. As indicated in Table V:5, cotton output per hectare has ranged between 2200 kgs. to 2600 kgs. with a five year average of 2400 kgs. There are, however, in any given year considerable variability in output per farmer and per hectare. In 1984/85 and 1985/86, there was a margin of 2500 kgs. between the poorest and best producers. In the three most recent years, the margin has narrowed to a still substantial 1500 kgs. per hectare.

(2) Wheat

As with cotton, wheat farm output at this scheme has also been fluctuating from 1984/85 to 1988/89. But, in general their wheat farm output over the five years has been very good. They have always realized an average of more than 3000 kilograms per hectare. Table V:6 shows that 1984/85 was the year of greatest variability in output with the lowest output at 1,030 kg/ha and the highest at 9,940. In the ensuing years variability has decreased but the best producer with 2,670 kg/ha minimum had 870 kg/ha more than the poorest producer with 1,800 kg/ha minimum. On

Table V:5
Cotton Farm Output Over Five Years

Year	Minimum Output (kgs/ha.)	Maximum Output (kgs/ha.)	Average Output (kgs/ha.)
1984/85	1,250	3,760	2,600
1985/86	920	3,490	2,200
1986/87	1,480	3,170	2,590
1987/88	1,480	3,200	2,290
1988/89	1,490	3,210	2,320
TOTAL For 5 years	6,620	16,830	12,000 2,400

Table V:6
Wheat Farm Output Over Five Years

Year	Minimum Output (kgs./ha)	Maximum Output (kgs./ha)	Average Output (kgs./ha)
1984/85	1,030	9,940	3,080
1985/86	2,670	5,240	4,100
1986/87	1,580	5,540	3,970
1987/88	1,940	4,870	3,620
1988/89	1,800	4,470	3,680
TOTAL For 5 years	9,020	30,060	18,450 3,690

average, these farmers are producing wheat within the national high farm output level.

The farmers at Middle Sabi sell all their cotton and wheat to Official Marketing Boards. The minimum income they got from selling cotton and wheat in 1988 was Z$15000 with a maximum of Z$46000 and an average of Z$35000. Most of the money they used to purchase inputs for their crops was either from their own savings, or from the Agricultural Finance Corporation (A.F.C.), or from commercial banks. The majority of them, 27 (63%) got loans from A.F.C. and the remaining 16 (37%) farmers got loans from commercial banks. Out of the 43 farmers, 42 (98%) farmers used their loans to buy inputs and only one farmer (2.3%) used his/her loan to pay his/her farm laborers. After selling their cotton and wheat, 38 (88%) farmers were able to repay all their loans, while 5 (12%) farmers paid only part of their loans. These five farmers are among the ones who realized low farm output in cotton and wheat. As a result, they got low income from their crop sales and were paying their loan balances by installments.

Sources of Farming Information

As was noted earlier in the review of the literature, on the whole, education (formal, informal and non-formal) tends to increase the probability that farmers will seek additional farming information more actively, and often such information is obtained from family members, neighbours, friends, other farmers,

newspapers, agricultural publications and more so from extension agents. But this tendency does not necessarily imply a specific combined effect of education and extension.

In general, all farmers at Middle Sabi discuss their farming activities several times per month with their family members, neighbours, and other farmers in the scheme. In addition, they discuss only once a month with their farmers' committee. As for the available sources of information, 32 (72%) farmers reported that they get most of their farming information from the local extension officers and 12 (28%) farmers get their farming information from the radio, newspapers and agricultural publications. However, 42 (98%) farmers reported that information from their local extension officers is the most useful for their farming farm output.

In addition to the available farming information sources for these farmers, 41 (95%) farmers attended agricultural extension courses and only 2 (5%) farmers had not attended any of the offered courses. The courses offered to the farmers are on crops, irrigation, planting and bookkeeping.

Prior to 1989, farmers at this scheme reported that they had experienced a number of problems with their crops. The farmers who had experienced problems on insufficient tillage units, shortage of irrigation water during the dry seasons and insufficient transport at the time of marketing their crops were 24 (56%) and,

12 (28%) farmers had experienced too many pests during their cotton growing season. The other 7 (16%) farmers had problems of delays in the delivery of crops' inputs, crop diseases and even lands which needed to be levelled to avoid water logging during irrigation.

However, 41 (95%) farmers solved their problems by consulting their local agricultural extension officer. The other 2 (5%) farmers either consulted their neighbours or solved it by themselves. But, when asked about the advice they would give to a newcomer, 23 (54%) farmers reported that they would advise a new farmer to develop some management skills for crops and labour. Also, 12 (28%) farmers would advise a newcomer to the scheme to work hard in order to get high farm output, 4 (9%) farmers would advise a new farmer to cooperate with other farmers and staff and to seek and follow the local agricultural extension officer's advice. The other 4 (9%) farmers did not respond.

The descriptive overview of the data for the irrigation farmers presented in this section of the chapter is now followed a step further by analyzing data to determine which factors affect output. First, the use of crosstabulations in the next subsection produces 2 way to n-way tabulations for variables having a limited number of distinct values. The observed cell frequencies are expressed as raw, column or table percentages and the statistics therein measure the strength of association between the more

important independent variables and the cotton, wheat and milk farm output dependent variables. Second, the use of regression analysis in the next sub-section presents, in the first instance, those independent variables that are more important for cotton, wheat and milk farm output and then isolates the most important variables for cotton and wheat.

Association Between Independent Variables and Cotton Output

The use of crosstabulations in this section, examines the relationship between the output of cotton and wheat and farmer's farming experience, formal education, age and the number of people in a farmer's family. Crosstabulations are also used to measure the association of farmer's age and formal education; farmer's output and non-formal education and farmer's formal education and non-formal education.

In the tables that follow productivity is measured by five year averages for output of cotton and wheat. Because the total number of farmers in the irrigation scheme that is the object of study here, is small, the interpretations of the crosstabulations are necessarily cautious and tentative. The data do however give a picture of the nature of relationships that obtain between the independent variables and productivity. The strength and priority of any relationships between the independent and dependent variables will be more firmly established through the regressional analysis. Only those crosstabulations that show a clear relation

between background variables and productivity are reproduced here, though of course a number of additional relationships were examined.

1. Cotton Output

a. Cotton Output by Farmer's Age

Table V:7 presents crosstabulated grouped data on farmer's age and cotton output. Looking first at the youngest farmers those between 29 and 39 years of age, 21% are in low output group 43% are in the middle group and 36% are in the high output group. Those farmers in the 40 to 49 year old group are more productive than the younger farmers with 13% low producers, 40% medium producers and 47% high producers. The oldest farmers have the lowest levels of productivity in cotton. Nearly half (46%) farmers over fifty fall in the low output group, another 46% fall in the medium productivity group, while only 6% are highly productive. Clearly age of the farmer is an important factor in productivity.

b. Cotton Output by Farmer's Formal Education

The crosstabulated grouped data presented in Table V:8 on farmer's level of formal education and cotton output show that among the 22 farmers with low education of 5 to 8 years, 41% are in the low output group, 27% are in the middle output group and 32% are in the high output group. On the other hand, the 20 farmers with high formal education of 9 to 13 years, only 10% are in the low output group, 60% are in the middle output group and

Table V:7
Cotton Output by Farmer's Age

	Farmer's Age (yrs.)			
	29 to 39	40 to 49	50 to 63	Raw Total
900 to 2140 kg/ha	21% (3)	13% (2)	46% (6)	26% (11)
2150 to 2540 kg/ha	43% (6)	40% (6)	46% (6)	43% (18)
2550 to 3790 kg/ha	36% (5)	47% (7)	8% (1)	31% (13)
Column Total	100% (14)	100% (15)	100% (13)	100% (42)

Table V:8
Cotton Output by Farmer's Formal Education

	Farmer's Formal Education (yrs.)					
	5 to 8		9 to 13		Raw Total	
900 to 2140 kg/ha	41%	(9)	10%	(2)	26%	(11)
2150 to 2540 kg/ha	27%	(6)	60%	(12)	43%	(18)
2550 to 3790 kg/ha	32%	(7)	30%	(6)	31%	(13)
Column Total	100%	(22)	100%	(20)	100%	(42)

30% are in the high output group. The less educated farmers have the lowest levels of productivity in cotton and more than half (60%) of the educated have the middle levels of cotton output.

c. Farmer's Age by Farmer's Formal Education

Although Table V:9 shows that there is almost an even distribution of farmers in all the three age categories, and the two categories of formal education, 20% (3) of the youngest farmers aged 29 to 39 years have low formal education while 80% (12) have high education. Among the 15 middle aged farmers of 40 to 49 years old, 60% (9) have low education and 40% (6) have high education. As expected, of the 13 older farmers of 50 to 63 years old, 77% (10) have low education and only 23% (3) have high education. Clearly, the older farmers have lower formal education and the younger farmers have higher formal education. It is not surprising then that both age and education are related to productivity, since age and education are themselves related inversely.

d. Cotton Output by Farmer's Previous Agricultural Experience

Two aspects of previous farming experience were examined as possible contributers to cotton output. The contribution of previous farming experience to cotton productivity shows no clear pattern. However, cotton output does appear to be affected by previous irrigation experience. Of those farmers with less than 4 years experience with irrigation, Table V:10 shows that 42% (6)

fall in the low productivity category and 29% in each of the medium and high cotton output categories. Farmers with 5 to 10 years irrigation experience were less likely to be low producers. Only 29% (4) were in the low category, 42% (6) were in the medium category and 29% (4) were in the high category. The farmers with the most irrigation experience were also the most productive, with 7% (1) in the low cotton output category, 57% (8) in the middle output category and 36% (5) in the high output category.

e. Cotton Output by the Number of People Over 10 Years Old in a Farmer's Family

The objective of crosstabulating farmers' cotton output with the number of people in a farmer's family is to find out if the number of people as a source of farmer's labour has any relationship to farmer's cotton output. The number of farmers with small families having less than 3 members over age 10 was only four, none of whom had low productivity. As can be seen from Table V:11, out of the 25 farmers with medium family size, 24% (6) had low output while 56% (14) had medium cotton output and 20% (5) had high output. On the other hand, those with larger families of 8 to 13, out of the 13 farmers, 38% (5) had low output, 16% (2) had medium output and 46% (6) had high output.

These findings are somewhat curious because farmers with the largest number of family members were more likely to have the lowest and the highest productivity relative to the other two groups. Such a finding may reflect the fact that cotton production

Table V:9
Farmer's Age by Farmer's Formal Education

	Farmer's Formal Education (yrs.)					
	5 to 8		9 to 13		Raw Total	
29 to 39	20%	(3)	80%	(12)	35%	(15)
40 to 49	60%	(9)	40%	(6)	35%	(15)
50 to 63	77%	(10)	23%	(3)	30%	(13)
Column Total		(22)		(21)	100%	(43)

Table V:10
Cotton Output by Farmer's Previous Irrigation Experience

	Farmer's Previous Irrigation Experience (yrs.)			
	0 to 4	5 to 10	11 to 22	Raw Total
900 to 2140 kg/ha	42% (6)	29% (4)	7% (1)	26% (11)
2150 to 2540 kg/ha	29% (4)	42% (6)	57% (8)	43% (18)
2550 to 3790 kg/ha	29% (4)	29% (4)	36% (5)	31% (13)
Column Total	100% (14)	100% (14)	100% (14)	100% (42)

Table V:11
Cotton Output by the Number of People over Ten Years Old in a Farmer's Family

	Number of People in a Farmer's Family							
	1 to 3		4 to 7		8 to 13		Raw Total	
900 to 2140 kg/ha	0%	(0)	24%	(6)	38%	(5)	26%	(11)
2150 to 2540 kg/ha	50%	(2)	56%	(14)	16%	(2)	43%	(18)
2550 to 3790 kg/ha	50%	(2)	20%	(5)	46%	(6)	31%	(13)
Column Total	100%	(4)	100%	(25)	100%	(13)	100%	(42)

is labour intensive and so those farmers with the most labour at their disposal have higher productivity. At the same time farmers with the largest mature families are also more likely to be the oldest, least educated farmers who have lower productivity than younger better educated farmers.

f. Cotton Output by Use of Farming Information From Agricultural Extension Officers

All but 2 farmers at Middle Sabi attended agricultural extension courses, both of these were, however, low in productivity. As a consequence, the table is not reproduced here. Farmers differed more in the degree to which they made use of information from extension officers. As can be seen from Table V:12, farmers at Middle Sabi use farming information from their agricultural extension officers daily or at least more than once a week. No farmers reported contact of less than more than once per week. Of those farmers in daily contact with extension officers, only 14% (4) have low output, while 43% (13) have medium production and another 43% (13) have high production. On the other hand, 58% (7) who use that information more than once a week are at the low output level and 42% (5) are in the medium output level with none in the high output category. There is a strong relationship between farmer's frequency of suing farming information from extension officers and high cotton output. In conclusion, it is worth noting that farmer's formal education does not appear to be related to either their use of information from

agricultural extension officers or to their use of other media of information.

g. Cotton Output by Farmer's Frequency of Listening to Agricultural Information from the Radio

In the case of written information in agricultural publications, there did not appear to be any relationship between frequency of exposure to such information and cotton output. The pattern in Table V:13 is mixed and it is difficult to discern neat patterns of information derived from the radio.

Of the 12 farmers who daily derive information from the radio, 8% (1) have low output, 83% (10) have medium output and another 8% (1) have high cotton output. In the case of those who derive information from the radio more than once per week and less than one per week, 29% (4) in each case have low or medium cotton output, while 41% (6) in each case have high output. As such, there is some degree of relationship between frequency of deriving information from the radio and cotton output, with the most frequent listeners more likely to fall in the medium or high productivity categories.

h. Farmer's Formal Education by Farmer's Use of Farming Information from Agricultural Extension Officers

Table V:14 shows that among the 31 farmers who use farming information from agricultural extension officers daily, 48% (5) of them have low formal education and 52% (16) have high education. On the other hand, among 12 farmers who use this information more

Table V:12
Cotton Output by Use of Farming Information from Agricultural Extension Officers

	Farmer's Use of Farming Information from Officers		
	Daily	More Than Once/Week	Raw Total
900 to 2140 kg/ha	14% (4)	58% (7)	26% (11)
2150 to 2540 kg/ha	43% (13)	42% (5)	43% (18)
2550 to 3790 hg/ha	43% (13)	0% (0)	31% (13)
Column Total	100% (30)	100% (12)	100% (42)

Table V:13
Cotton Output by Farmer's Frequency of Listening to Agricultural Information From the Radio

	Farmer's Frequency of Information from Radio			
	Daily	More Than Once/Week	Less Than Once/Week	Raw Total
900 to 2140 kg/ha	8% (1)	29% (4)	29% (4)	23% (9)
2150 to 2540 kg/ha	83% (10)	29% (4)	29% (4)	45% (18)
2550 to 3790 hg/ha	8% (1)	42% (6)	42% (6)	32% (13)
Column Total	100% (12)	100% (14)	100% (14)	100% (40)

than once a week, 58% (7) of them have low education while 42% (5) have high formal education. There is a small positive relationship between farmers with high education and their use of non-formal education from extension officers. This is consistent with Perraton, Jamieson and Oribvel's (1981) findings in Malawi and discussed earlier in chapter three that educated farmers are more likely to be in contact with extension agents. Neither information from reading agricultural publications, attending agricultural extension courses or listening to farming broadcasts has any demonstratable relationship to farmer's formal education.

2. Wheat Output

a. Wheat Output by Farmer's Age

The relationship in Table V:15 is different from cotton output where the oldest farmers were less productive. Also unlike cotton output, in the case of wheat output, differences in formal education do not appear to be related to wheat output. Among the youngest farmers who were between 29 and 39 years of age, 27% (4)

Table V:14
Farmer's Formal Education by Farmer's Use of Farming Information from Agricultural Extension Officers

	Farmer's Use of Farming Information from Officers		
	Daily	More Than Once/Week	Raw Total
5 to 8 yrs.	48% (5)	58% (7)	51% (22)
9 to 13 yrs.	52% (16)	42% (5)	49% (21)
Column Total	100% (31)	100% (12)	100% (43)

Table V:15
Wheat Output by Farmer's Age

	Farmer's Age (yrs.)			
	29 to 39	40 to 49	50 to 63	Raw Total
1000 to 3390 kg/ha	27% (4)	33% (5)	31% (4)	30% (13)
3400 to 3890 kg/ha	60% (9)	33% (5)	23% (3)	40% (17)
3900 to 9950 kg/ha	13% (2)	33% (5)	46% (6)	30% (13
Column Total	100% (15)	100% (15)	100% (13)	100% (43)

had low wheat output, 60% (9) had medium output and 13% (2) had high output. The middle aged farmers of 40 to 49 years of age, 33% (5) in each case are in the low, medium and high output categories. On the other hand, those oldest farmers in the 50 to 63 years old group, 31% (4) are in the low output category, 23% (3) are in the medium and 46% (6) are in the high output level. Overall while the youngest farmers are not expected to be in the low productivity category, it is the oldest farmers who are most likely to be in the high productivity category.

b. Wheat Output by Agricultural Experience and Family Labour

Neither previous farming experience nor irrigation experience appear to have a marked impact on wheat output. Unlike cotton, where experience with irrigation appeared to be related to higher levels of cotton output, wheat output, perhaps because wheat is a new crop to most farmers, does not appear to be affected by previous experience or experience in the scheme.

The availability of family labour too has little effect on productivity. While in cotton production which is labour intensive, the availability of family labour contributed to output, such is not the case for wheat.

c. Wheat Output by Farming Information from Agricultural Extension Officers

Among the 31 (72%) farmers who use farming information from agricultural extension officers daily, 26% (8) had low wheat

output, 35% (11) had medium output, and 39% (12) had high output. On the other hand, 42% (5) of the farmers who use this information more than once a week had low output, 50% (6) had medium output and only 8% (1) had high output. Table V:16 shows that farmers who frequently use information from their extension officers realize higher wheat output.

d. Wheat Output by Farmer's Frequency of Listening to Agricultural Information from the Radio

The results in Table V:17 are somewhat anomalous. Contrary to expectation, those farmers who listen daily to farm broadcasts are the least productive, 50% (6) are in the low output category and 25% (3) in each of the medium and high output categories. In the case of those who listen to agricultural broadcasts more than once a week, 27% (4) are low in productivity, 53% (8) in medium and 20% (3) in high output. The farmers who listen less than once a week are the most productive with 7% (1) in the low output category, 43% (6) in the medium and 50% (7) in the high output category.

Regression Analysis for Cotton and Wheat Output

In order to learn more about the factors affecting the output of cotton and wheat regression techniques were used. The following fourteen independent variables regarding farmers' background, farming experience, formal education levels, non-formal and informal education exposure were entered into the regression analysis to determine the most important variables affecting the output of cotton and wheat.

Table V:16
Wheat Output by Use of Farming Information from Agricultural Extension Officers

	Farmer's Use of Farming Information from Officers		
	Daily	More Than Once/Week	Raw Total
1000 to 3390 kg/ha	26% (8)	42% (5)	30% (13)
3400 to 3890 kg/ha	35% (11)	50% (6)	40% (17)
3900 to 9950 hg/ha	39% (12)	8% (1)	30% (13)
Column Total	100% (31)	100% (12)	100% (43)

Table V:17
Wheat Output by Farmer's Frequency of Listening to Agricultural Information From the Radio

	Farmer's Frequency of Information from Radio			
	Daily	More Than Once/Week	Less Than Once/Week	Raw Total
1000 to 3390 kg/ha	50% (6)	27% (4)	7% (1)	27% (11)
3400 to 3890 kg/ha	25% (3)	53% (8)	43% (6)	41% (17)
3900 to 9950 hg/ha	25% (3)	20% (3)	50% (7)	32% (13)
Column Total	100% (12)	100% (15)	100% (14)	100% (41)

(a) Farmers' Background

- Farmers' age;
- Average age of family members over age of 14 for literacy and 10 for labour;
- Type of farmers' farming background before coming to the scheme; and
- Number of people living in a farmer's family.

(b) Farming Experience

- Number of years a farmer has had farming experience in the scheme;
- Number of years a farmer had farming experience before coming to the scheme;
- Farmers' previous irrigation experience; and
- Frequency of irrigation cycles in cotton and wheat crops.

(c) Formal Education

- Farmers' highest formal education level;
- Highest formal education levels of farmers' family members over the age of 14.

(d) Non-Formal and Informal Education

- Use of farming information from agricultural extension officers;
- Farmers' attendance at agricultural extension courses;
- Farmers' frequency of listening to agricultural

information from the radio; and

- Farmers' frequency of reading farming information from agricultural publications.

The above fourteen variables were entered into the regression equation for cotton and wheat. Seven of the fourteen variables came out as the most important factors for the output of cotton and wheat. For cotton, the seven independent variables shown in Table V:18 came out as the most important variables for cotton output, accounting for 61.6% of the variance.

Although Jamieson and Lau, in their studies of Korea, Malaysia, Nepal and Thailand demonstrated that formal education increased physical farm output, the results in Table V:18 demonstrate that farmer's use of information from extension officers had the greatest impact on cotton output at Middle Sabi, accounting for 33% of the variance. This finding confirms the expectation of this study that productivity would be linked to participation in non-formal education and particularly to the use of advice from extension officers. Contrary to the indication of the crosstabulational analysis, in the regression analysis, formal education does not appear among those variables which have a significant effect on cotton output.

Although the crosstabulation showed only 2 farmers did not attend agricultural extension courses they were also low in productivity. This is consistent with the finding from the

Table V:18
The Most Significant Variables Influencing Cotton Farm Output (1990)

Significant Variable	Cumulative R^2*	Partial R^2	Level of Significance
Use of Information from Extension Officers	0.329	0.329	$p < 0.0007$
Attendance at respective Agricultural Extension Courses	0.502	0.173	$p < 0.0001$
Farmers' Age	0.554	0.052	$p < 0.0001$
Frequency of Listening to Agricultural Information from the Radio	0.604	0.046	$p < 0.0005$
Average Education of Family Members Over Age 14[a]	0.576	0.022	$p < 0.0001$
Averarge Age of Family Members Over Age 10[b]	0.588	0.012	$p < 0.0003$
No. of People Living in a Farmer's Family	0.616	0.012	$p < 0.0011$

* $R^2 \times 100$ = Percentage variance explained by an independent variable.

[a] 14 Years = Farmers' spouses and their older children over the age of 14 years who are above the optimum education levels (7 to 13 years formal education) and are able to provide assistance to farmers with weak literacy and numeracy skills.

[b] 10 Years = The age at which children are likely to become a significant source of labour for the farmer.

regression analysis in which 17% of the variance is related to attendance at extension courses.

This analysis also demonstrates a small association, R^2 = 5%, between the farmer's age and productivity. As the crosstabulations indicated, those farmers between 40 and 49 were the most productive. No doubt, the fact that this relationship is not linear affected the strength of the relationship. Given that the crosstabulations showed a relationship between age and education, some part of the relationship between formal education and productivity may be captured in the age variable.

The findings from this analysis also show that it is the farmers who frequently listen to the radio who realize higher cotton output. This complements the results of the crosstabulations (see Table V:13) which showed that the most frequent listeners were least likely to fall in the low productivity category. Although less frequent listeners were more likely to fall in the highest productivity category they were also more likely to be among the lowest producers.

The three factors pertaining to informal and non-formal education used in the model were; the use of agricultural information from extension officers, farmer's attendance at agricultural extension courses and farmer's frequency of listening to agricultural information from the radio. Despite evidence from the literature that educational levels of farmers have a positive

effect on farm output and results from the crosstabulations that 60% of the farmers with high formal education have the middle levels of cotton output (see Table V:8), the regression shows that more educated members of farmer's families are able to provide assistance in terms of literacy and numeracy skills. Farmers age, the age of family members over age 10 and the number of people living in a farmer's family, all pertain to labour source for farm output.

The same fourteen independent variables for cotton were also entered into the wheat model. Seven independent variables are included in the following Table V:19 came out as the most important variables for wheat output, accounting for 38.5% of the variance. As evidenced earlier in the crosstabulations (see Table V:14), older farmers are more productive in wheat. Although farmer's farming experience in the scheme was not included in the crosstabulation analysis, the farmer's previous farming and irrigation experiences which were in the crosstabulational analysis showed no significant relationship with wheat output. In the regression analysis, the second most important variable for wheat output is the farmers' farming experience in the scheme.

For wheat, older farmers who have more farming experience in the scheme tend to combine their maturity and experience with the use of information from extension officers to realize higher farm output. This is consistent with the cotton crosstabulation results

Table V:19
The Most Significant Variables Influencing Wheat Farm Output (1990)

Significant Variable	Cumulative R^{2}•	Partial R^{2}	Level of Significance
Farmers' Age	0.112	0.112	$p < 0.0660$
Farming Experience in the Scheme	0.223	0.111	$p < 0.0291$
Use of Information from Extension Officers	0.257	0.034	$p < 0.0429$
Attendance at respective Agricultural Extension Courses	0.294	0.037	$p < 0.0524$
Frequency of Listening to Agricultural Information from the Radio	0.331	0.037	$p < 0.0597$
Average Education of Family Members Over Age 14*	0.356	0.025	$p < 0.0776$
Farmers' Previous Irrigation Experience Before Coming to the Scheme	0.385	0.029	$p < 0.0903$

• R^{2} x 100 = Percentage Variance explained by an independent variable.

* 14 Years = Farmers' spouses and their older children over the age of 14 years who are above the optimum education levels (7 to 13 years formal education) and are able to provide assistance to farmers with weak literacy and numeracy skills.

that older (middle aged) farmers with more previous irrigation experience realize higher cotton output (see Tables V:7 and 10). As evidenced in Table V:15 of the crosstabulations where farmers who use information from extension officers more frequently realize higher wheat output, in the regression analysis the positive contribution of the same information from extension officers for wheat output is complimented by the farmers' attendance at agricultural extension courses. Again, farmer's frequency of listening to farming broadcasts has some positive contribution to the output of wheat accounting for 4% of the variance. Another 4% of the variance was accounted for by the formal education of family members over age 14.

Although in the crosstabulational analysis the farmer's previous experience before coming to the scheme did not appear to affect productivity, in the regression analysis, it accounted for a small (3%) but significant portion of variance in productivity. It would appear then that previous irrigation experience enhances experience in the scheme to increase wheat output.

For wheat, the informal and non-formal education factors which contribute to output are the use of information from extension officers, attendance at agricultural extension courses and frequency of listening to agricultural information from the radio. The average education of family members over age 14 is a formal education factor. The remaining significant variables for

wheat production are the farmers age, experience in the scheme and previous irrigation experience.

SUMMARY

The irrigation farmers at Middle Sabi have a reasonably high level of formal education averaging 8 years and are exposed to extensive extension services, in a modernized farming system. The factors which came out as the most significant in influencing the variations in cotton and wheat farm output were analyzed and reported in stepwise multiple regression analysis. In addition, the indicators were indicative of the various perceived strengths and weaknesses that pertain to the Middle Sabi Scheme and other similar Model "C" Resettlement Schemes in Zimbabwe.

A stepwise multiple regression analysis identified the variables that influenced cotton and wheat farm output. These independent variables are farming information from the local agricultural extension officers, the age of the individual farmers, the farmer's attendance at the offered agricultural extension courses and the number of years a farmer farms in the scheme for experience. As a result, looking at a farmers' farm output, it is usually the case that the mature and the more productive farmers constantly seek information from extension officers and continue to operate efficiently for a long period in these Model "C" Resettlement schemes.

The findings which were presented in the data analysis in regression and frequencies were discussed with reference to the nine research questions posed in chapter three. Following the analysis of data pertaining to a particular sub-problem, a brief discussion of the findings was presented. Interpretations and explanations were provided whenever necessary, otherwise, the statistics have been left, for the most part, to speak for themselves.

When the importance of age in terms of labour supply was examined, it was found that the farmers' age and the age of other members of a farmer's family who are above ten years of age play an important role in the output of both cotton and wheat. This is so, because both crops are relatively labour-intensive. Complementary to that, the farm output levels for the irrigation farmers showed that the more frequent contacts the farmers had with their extension agents, the higher were their farm outputs.

At this scheme, a farmer's formal education was found not to be important in the farm output of cotton and wheat. However, formal education for members of a farmer's family had some positive contribution to the farm output of both cotton and wheat. Therefore, there is need for some formal education in a farmer's family in order to interpret and implement innovations and the new technology. On the other hand, informal and non-formal education through attending agricultural extension courses, the number of

years a farmer farms on the scheme and the agricultural extension services/education provided to these farmers had high contributions in the farm output of both their cotton and wheat crops.

SECTION 2: THE DAIRY FARMERS

As with Middle Sabi, the Rusitu Small-scale Dairy Resettlement Scheme is also a state controlled dairy scheme for small-scale farmers. Although the scheme has a potential for 600 settler farmers each with 4 hectares of land, at the time of the interview, there were 348 settler farmers in the scheme, 205 (60%) of whom were interviewed.

Family and Farmer Background

At Rusitu, 33 farmers, 20 (61%) of whom were interviewed are female. Of the dairy farmers interviewed at Rusitu (39%) were under 35. This is a much younger group than at Middle Sabi where only 9% (4) of the farmers were under 35. Farmers at Rusitu ranged in age from 17 to 75 years of age and averaged 38. As was mentioned earlier in Section 1, this age pattern affects both the size of their families and the age of their children. Generally, Rusitu farmers have reasonably large families. Their family size ranged from 1 to 27 and averaged 6. Although their family size range is wider than the Middle sabi family size range, their average was slightly below the Middle Sabi average. Almost all

farmers had children old enough to help in farming activities. Only 49 (24%) farmers had no children over age 10, the age at which children are likely to become a reasonably significant source of labour. At Rusitu, 35 (17%) farmers had 1 to 2 children, 121 (59%) had 3 or more children old enough to help on the farm. The 20 women who were interviewed are all included in the above numbers. Spouses are also potential farm workers. All but 22 (11%) farmers were married, 142 (69%) with one wife, 41 (20%) with 2 wives or more. Generally, the wives were younger than the farmers averaging 33 years of age. The 22 single farmers were either divorced, widowed or single parents.

Educational Background

Reflecting the limited educational opportunities for blacks prior to independence, 34% (70) of farmers at Rusitu had less than 5 years of formal education. Just over half (108 or 53%) of the farmers had between 5 and 8 years of formal education and 27 (13%) farmers had 9 to 17 years of education with the average being 6 years of formal education. In general, Rusitu farmers have lower levels of education than Middle Sabi farmers. This is reflected in their numeracy and literacy scores. A majority of them, 132 (64%) were literate and 73 (36%) farmers were illiterate. The literate farmers were able to read the questions on problem solving and answer them, yet the illiterate ones could not read nor write anything on the questionnaire. In cases where a farmer's own

literacy and numeracy skills may be weak, other more educated family members may provide such assistance to the farmer. The educational levels of the farmers' spouses, and that of family members over the age of 14 years averaged 4 years. Out of the 241 spouses, only 37 (18%) had 8 to 14 years of formal schooling with an average of 11 years. Other family members also averaged 4 years of formal education.

Farming Experience

A majority (90% or 195) of Rusitu farmers had some farming experience before coming to the resettlement scheme. Just above half, 104 (51%) farmers had been subsistence farmers, though that experience was not necessarily related to their current dairy farming activities. In addition, 78 (38%) farmers had been employees on large commercial farms, while only 2 (1%) farmers had been small-scale commercial farmers. When compared to Middle Sabi farmers, 45% of the Middle Sabi farmers had been small-scale commercial farmers as compared to only 1% at Rusitu. While, 15% of the irrigation farmers had been subsistence farmers, 51% at Rusitu had been subsistence farmers. Therefore the calibre of farmers at Rusitu is lower than the Middle Sabi farmers. A very small number of farmers, 29 (14%) had some prior dairy experience ranging between 1 to 5 years.

The majority (84% or 172) of the Rusitu farmers had been in the scheme between 3 and 7 years while only 1% or 1 farmer had

been in the scheme for one year or less. Since dairy experience is one of the factors which could be expected to influence milk output, the majority of these farmers should show the benefits of that experience.

There is a widespread usage of family labour during land preparation and planting at Rusitu because most farm families are large enough to include members who could assist in the activities associated with milk farm output. For instance, when planting nappier fodder, only 5 (2%) farmers did not use family labour. On average, farmers used three family members to assist them in this first stage of milk output. The practice of using family labour is also maintained at some level during the growing season of nappier fodder.

Complimentary to the labour provided by members of the farmers' immediate family, a number of farmers receive help from other relatives, but, not as extensively as that of family members. In this case help from other relatives was greatest during planting and declined thereafter. At land preparation and planting, 43 (21%) farmers reported help of relatives, while 34 (17%) received help during the growing season and 26 (13%) did so during harvest. In addition, the dairy farmers at Rusitu also make relatively extensive use of hired labour. During land preparation and planting, 124 (61%) farmers hired labour while 138 (67%) had hired labour during the growing season and 117 (57%) farmers also

used hired labour at harvest. As the figures above indicate, dairy farming activities are less labour intensive than cotton and wheat production at Middle Sabi.

Dairy farmers also receive assistance with feeding, milking, cleaning and the delivery of milk to the Central Milk Collection Centres. For feeding and milking, 181 (88%) farmers reported the help of 4 family members, while 5% (10) used between 5 to 9 family members, and 7% (14) did not use any family labour. The assistance from family members is also continued at cleaning and delivery of milk, only 12% (25) of farmers did not have family help in this activity. Although non-family relatives also provide help, this is much less extensive than that of family members. Only 11% (23) of farmers used relatives assistance for feeding and milking and 12% (25) for cleaning and delivering. The number of relatives involved is also small. As might be expected, given the above observations, Rusitu farmers use hired labour less than Middle Sabi farmers, about half (48%) for feeding and milking and 49% for cleaning and delivery. Overall, it is clear that mostly cotton production at Middle Sabi is much more dependent on labour than is wheat over and above the farmers' own labour input.

Although having an education and the knowledge that goes with it and having sufficient labour may enhance milk output, the type of cattle one milks has a major effect on farm output. At Rusitu, 51% (105) of the farmers milk the recommended crossbreed cows.

Fresian cows are milked by 15% (30) of the farmers and another 6% (10) milked Jerseys. Over a quarter (28% or 57) continued to milk the local Shona cows despite the fact that they are not recommended because they are low yielding. Also, due to the limited farm size per farmer, farmers are allowed to keep up to 7 dairy cows per family under the zero grazing system. The majority of farmers, 190 (93%) stayed within this guideline, however, 8 (4%) exceeded the recommended number by owning 8 to 9 dairy cows per family.

While milk output is influenced by a number of the factors discussed earlier, the number of dairy cows and the frequency of milking per day are crucial determinants of output. In this case, 170 (87%) farmers milked 1 to 6 cows per day with 113 (55%) farmers milking twice a day and 2% (4) with 7 to 9 cows milking three times per day. The other 69 (34%) milked their cows only once a day while 11% (23) were not milking any cow at the time of the interview. The majority of their dairy cows are crossbred by artificially inseminating them once or twice and 87% (178) farmers had used this method while 13% (27) had not used the recommended technique.

The Agricultural Development Authority (A.D.A.) provides tillage units at cost to the dairy farmers. But, farmers are also free to hire tillage units from any source of their choice. In this case, 66% (136) hired from private sources, 2% (4) from

A.D.A., 28% (57) used their own traditional tillage sources and 8 (4%) farmers did not report the source of their tillage units. The traditional tillage sources used were oxen, donkeys, and the hoe.

Milk Farm Output

"Milk farm output" in kilograms per cow over a period of three years was the dependent variable. Although the aim was to see the variations in the farmers' milk output from 1984/85 to 1988/89, the major objective was to see if there is any relationship between their formal, informal and non-formal education and their milk farm output. At Rusitu there was no milk output for the first two years of the projects operation from 1984/85 to 1985/86. The first milk output levels realized in 1986/87 were very low because most farmers could not sell their milk to the Dairy Marketing Board (D.M.B.) due to the required sanitation and quality standards. Consequently, milk output at Rusitu remained at fairly low levels until 1988/89 when the minimum output went up 200% from 100 kg/cow to 300 kg/cow and the highest output moved up 36% from 1,923 kg/cow to 2,619 kg/cow. The following Table V:20 shows the minimum, maximum and average milk farm output for this scheme from year 3 to year 5. Their three years of milk output averaged 406 kilograms per cow. Although their milk output levels are not all that high, the fact that they realized 78% increase in the maximum production levels over the three years, is encouraging.

At Rusitu, 82% of the farmers sell their milk to the Official Dairy Marketing Board, but 17% had not sold any milk at the time of the interview. They realized maximum income of Z$4409 per year per farmer with an average income of Z$393 from their 1988/89 milk sales. A majority of farmers (61%) finance their dairy operations from their own pockets because only 39% were eligible to receive loans from the Agricultural Finance Cooperation (A.F.C.). Among those who got loans from A.F.C., 19% repaid their loans completely, while 18% paid part of their loans and 4% had not paid their loans yet. Among those who only paid part of their loans and those who had not paid any part of their loans, 11% were still paying by installment, and 7% had insufficient funds because of low milk output because some of their dairy cows died.

Sources of Dairy Farming Information

As with the Middle Sabi farmers, the Rusitu farmers tend to get most of their dairy farming information (informally and non-formally) from their agricultural extension officers. In addition, they also discuss their dairy farming activities several times per month with their family members, friends and neighbours and other farmers in the scheme. They have discussions with their farmers' committee only once a month. All these information sources, are potential contributors to behavioral changes that may lead to increasing farmer's milk output.

Table V:20
Milk Farm Output Over Three Years

Year	Minimum Output (kgs./cow)	Maximum Output (kgs./cow)	Average Output (kgs./cow)
1986/87	100	1,468	365
1987/88	100	1,923	417
1988/89	300	2,619	437
TOTAL For 5 Years	500	6,010	1,218 406

Among the available sources of information, 64% (131) of the farmers reported that they get most of their dairy farming information from their local extension officers while 36% (74) farmers get most of their dairy farming information from agricultural publications, newspapers and radios.

Among the 135 respondents, 118 (92%) farmers had attended some agricultural extension courses on dairy management, application of artificial insemination (A.I.), crops, planting nappier fodder, and bookkeeping, while 17 (8%) had not attended any agricultural extension course.

At Rusitu 95% (193) of the farmers had experienced problems with milk mastitis disease, A.I. problems, contagious abortion, insufficient feed for the dairy cows and no finance to buy inputs prior to 1989. The other 5% (11) did not know of any particular major problem they had experienced in the last five years. While a majority of 84% (172) of the farmers solved their problems by consulting their local extension officers, 16% (33) either consulted their neighbours, solved their problems by themselves, or hired specialists.

As with the irrigation farmers, the following sub-section also isolates the most important independent variables for the farm output of milk at Rusitu first, by using crosstabulations and second, by using regression analysis. In addition to presenting a summary for the dairy scheme results, a brief and general summary

which includes the irrigation results is presented.

Association Between Independent Variables and Milk Output

With milk output variation is crosstabulated by the same independent variable as for cotton and wheat with an addition of "cowbreed" in order to examine the relationship of association between the independent variables and milk output.

In the tables that follow in this section, milk output is measured by three year averages. Unlike Middle Sabi where the total number of farmers in the irrigation scheme is small, the number of dairy farmers at Rusitu is larger so that the interpretation of the crosstabulations can be given with more assurance. The data gives a picture of the nature of relationships obtained between the independent variables and milk output. As with cotton and wheat, the strength and priority of any relationship between the independent and dependent variables will also be more firmly established through the regression analysis. Although a number of additional relationships were examined, only those crosstabulations that show a clear relation between independent variables and milk output are reproduced here.

3. Milk Output

a. Milk Output by Farmer's Age

Results in Table V:21 show crosstabulated grouped data on farmer's age and milk output. Among the youngest dairy farmers who are between 17 and 33 years old, 40% (19) are in the low output

category, 37% (18) are in the medium and only 23% (11) are in the high output category. The middle aged farmers of 34 to 49 years of age, only 26% (24) are in the low output group, 38% (35) are in the medium output group and 36% (33) are in the high output group. On the other hand, among the oldest farmers of 50 to 75 years old, 26% (8) are low producers, about half of them, 45% (14) are medium producers and 29% (9) are high producers. From this analysis, middle aged farmers are the most productive while the youngest farmers are the least productive.

b. Milk Output by Agricultural Experience and Family Labour

Crosstabulated analysis of farmer's farming and dairy experience by milk output shows that there is a strong relationship between them. First, Table V:22 shows that among the 67 farmers at Rusitu who had the least previous farming experience, 28% (19) had low milk output, 36% (24) had medium and another 36% (24) had high milk output. Of the farmers with 7 to 14 years of experience, 32% (19) had low output, 43% (26) had medium output and only 25% (15) had high milk output. A similar pattern follows with farmers who had high experience that 35% (18) had low output, 36% (19) had medium out and 29% (15) high milk output. Previous farming experience does not appear to contribute greatly to milk output, indeed the least experienced are slightly more productive.

As can be seen from Table V:23, 94% (168) of the dairy

farmers had 0 to 4 years of previous dairy experience and only 6% (11 had no previous dairy experience. Of those farmers who had the least previous dairy experience, 32% (54) had low milk output and 30% (50) had high milk output. On the other hand farmers who had more than 5 years previous dairy experience, 18% (2) had low output, 46% (5) had medium output and 36% (4) had high output. As such farmers' dairy experience is positively related to higher milk output. Although farmers with medium and large families realized high milk output, those with small and medium families had medium milk output. As such the availability of family labour has little effect on milk output.

c. Formal and Non-formal Education and Milk Production

The overall effect of education variables on milk production in Rusitu appears to be minimal. Although most of the relevant tables are not reproduced here because education appears to have so little effect, some comment is appropriate since the expectation was that education would have an important impact on production. Formal education whether that of the farmer or of members of his/her family showed no clear relationship to output. Also, the level of the farmers' education did not seem to influence their use of the various modes of non-formal education.

Farmers at Rusitu did not make a great deal of use of written information, only six farmers used such resources more than once a month while over 80% seldom if ever did so. Given that the average

Table V:21
Milk Output by Farmer's Age

	Farmer's Age (yrs.)			
	17 to 33	34 to 49	50 to 75	Raw Total
1 to 259 kg/cow	40% (19)	26% (24)	26% (8)	30% (51)
260 to 589 kg/cow	37% (18)	38% (35)	45% (14)	39% (67)
590 to 1542 kg/cow	23% (11)	36% (33)	29% (9)	31% (53)
Column Total	100% (48)	100% (92)	100% (31)	100% (171)

Table V:22
Milk Output by Farmer's Years of Previous Farming Experience

	Farmer's Years of Previous Farming Experience (yrs.)			
	0 to 6	7 to 14	15 to 40	Raw Total
1 to 259 kg/cow	28% (19)	32% (19)	35% (18)	31% (56)
260 to 589 kg/cow	36% (24)	43% (26)	36% (19)	39% (69)
590 to 1542 kg/cow	36% (24)	25% (15)	29% (15)	30% (54)
Column Total	100% (67)	100% (60)	100% (52)	100% (179)

Table V:23
Milk Output by Farmer's Previous Dairy Experience

	Farmer's Previous Dairy Experience (yrs.)		
	0 to 4	More Than 5	Raw Total
1 to 259 kg/cow	32% (54)	18% (2)	31% (56)
260 to 589 kg/cow	38% (64)	46% (5)	39% (69)
590 to 1542 kg/cow	30% (50)	36% (4)	30% (54)
Column Total	100% (168)	100% (11)	100% (179)

education in the scheme was 6 years, this is, perhaps, to be expected. The few farmers who made reference to agricultural publications did not appear to have better productivity. Unlike reading, listening to agricultural extension information on radio broadcasts was reported by the majority of farmers but the frequency with which they listened had little effect on output. Attendance at agricultural extension courses does not appear to improve milk output either. The majority of the dairy farmers attended such extension courses with only 8% (15) indicating that they did not attend. Perhaps because the farmers at Rusitu are on average less educated, the influence of education on productivity is even less evident than at Middle Sabi. As the discussion below indicates the only non-formal education which appears to affect milk output is

the use of information from extension officers.

d. Milk Output by Use of Dairy Information From Agricultural Extension Officers

Unlike farmers at Middle Sabi where most farmers are in daily contact with extension officers, 66% of the Rusitu farmers use information from their extension officers more than once a week but only 7% have daily contact or use of extension officers' information. Table V:24 shows that an equal number of farmers who use dairy information from their agricultural extension officers daily fall into the low (46%) and medium (46%) milk output levels

Table V:24
Milk Output by Use of Dairy Information from Agricultural Extension Officers

	Farmer's Use of Dairy Information from Officers			
	Daily	More Than Once/Week	Less Than Once/Week	Raw Total
1 to 259 kg/cow	46% (6)	25% (30)	43% (20)	31% (56)
260 to 589 kg/cow	46% (6)	40% (47)	34% (16)	39% (69)
590 to 1542 kg/cow	8% (1)	35% (42)	23% (11)	30% (54)
Column Total	100% (13)	100% (119)	100% (47)	100% (179)

and only 8% (1) had high milk output. Of these farmers who use extension information more than once a week only 25% (30) are in the low output category. These farmers are the most productive. The farmers who use information from extension officers less than once per week are less productive, 43% (20) had low output, 34% (16) had medium output and only 23% (11) had high milk output. It would appear that greater productivity occurs among those with frequent, weekly contact with extension officers but not among those with the most frequent, daily contact.

e. Milk Output by Cowbreed

Since farmers at Rusitu use zero grazing system for their dairy farming, the state through A.D.A. strongly recommends that farmers use crossbreeds which are high milk yielding dairy cows suitable to the local environment. Despite that, farmers still own and use a number of other cowbreeds for their dairy.

The patterns of production for farmers with Fresian and Crossbred stock were quite similar. Of farmers with Fresian cows only 20% (5) were low producers, and equal proportions were medium (40% or 10) or high producers (40%). For crossbreeds, 26% (26) were low, 38% (37) were medium and another 37% (37) were high producers. In contrast, 40% (4) of farmers with Jersey stock and 50% (21) of those with Shona stock were low in milk output. Only 10% (1) of farmers with Jersey stock and 14% (6) of farmers with Shona stock had high milk output. Clearly the type of stock has an

important influence on milk productivity (see Table V:25).

Regression Analysis for Milk Output

The uses of regression analysis are discussed earlier in chapter four. For purposes of analysis of milk output, the same fourteen independent variables as were used in the analysis for cotton and wheat were entered into the milk equation with an exception of replacing irrigation cycles variable with cowbreed a farmer uses for dairy. The seven variables shown in the following Table V:26 were the most important factors affecting the farm output of milk at Rusitu.

The results show that longer experience in the scheme is related to increased milk output. Though this variable has the highest contribution to milk output, it accounts for only 9% of the variance. The second most important variable for milk output accounting for 3% of the variance is the farmer's use of dairy information from extension officers. This confirms Hong's (1975) study of 895 farmers in the Republic of Korea where he found that extension activities significantly increased the technical and economic efficiency of farmers, a tendency that becomes more marked in the case of older and better educated (formally, informally or non-formally) farmers. It is also consistent with Halim's (1976) finding of three samples of farmers in the Philippines that the number of contacts with extension agents significantly increases farm output. Results from crosstabulations

Table V:25
Milk Output by Cowbreed Farmers Use for Dairy

	Cowbreed Farmers Use for Dairy				
	Jersey	Fresian	Shona	Crossbreed	Raw Total
1 to 259 kg/cow	40% (4)	20% (5)	50% (21)	26% (26)	32% (56)
260 to 589 kg/cow	50% (5)	40% (10)	36% (15)	37% (37)	38% (67)
590 to 1542 kg/cow	10% (1)	40% (10)	14% (6)	37% (37)	30% (54)
Column Total	100% (10)	100% (25)	100% (42)	100% (100)	100% (177)

Table V:26
The Most Significant Variables Influencing Milk Farm Output (1990)

Significant Variable	Cumulative R^2*	Partial R^2	Level of Significance
Farming Experience in the Scheme	0.085	0.085	$p < 0.0002$
Use of Dairy Information from Extension Officers	0.118	0.033	$p < 0.0000$
The Breed of Dairy Cows Milked	0.131	0.013	$p < 0.0001$
Frequency of Dairy Information from Reading Agricultural Publications	0.144	0.013	$p < 0.0001$
No. of Farming Experience Years before Coming to the Scheme	0.151	0.007	$p < 0.0001$
Attendance of Agricultural Extension Courses	0.157	0.006	$p < 0.0002$
Farmers' Previous Dairy Experience before Coming to the Scheme	0.160	0.003	$p < 0.0003$

* $R^2 \times 100$ = Percentage variance explained by an independent variable.

also confirm that there is a positive relationship between a farmer's contact with extension officers and higher milk output.

The breed of dairy cows which farmers milk is a small but significant factor in milk output. This compliments dairy information from extension officers and farmers' farming experience. Although Fresian cows are the highest yielders of milk, crossbred stock are also higher in productivity than Jerseys or Shonas. Here the regression analysis confirms the results of the crosstabulations. Four other factors have significant though small effects on production. Two of these factors, frequency of reading agricultural publications and attendance at agricultural extension courses, are elements of non-formal education. The remaining two variables--years of previous farming experience and previous dairy experience--supplement the effects of experience in the Rusitu Scheme. Together, however, these four variables account for less than 3% of the variance in milk output. This is consistent with the limited effects of these factors observed in the crosstabulations.

In conclusion, it is important to note that the amount of variance accounted for by these seven variables whether cumulatively or individually is much less than was the case with either cotton or wheat. Only 16% of the variance in milk output is accounted for by the seven most important factors included in this analysis. This compares to 61.1% for cotton and 38.5% for wheat.

Similarly, the most important variable, years in the scheme accounts for 8.5% of the variance in milk, while use of information from extension officers accounts for 32.9% of the variance in cotton production and farmer's age as the most important variable accounted for 11.2 of the variance in wheat production.

SUMMARY

The findings from this chapter answer all the nine research questions which were highlighted in chapter three and which were used as a guide to the field research for this study. The findings from the regression analysis that the education of farmers' family members over age 14 accounted for 2.2% variance in the output of cotton and 2.5% variance in the wheat output answers the first research question on the relationship of formal education in a farmer's family is related to farm output, although education was not an important variable for the output of milk.

The second research question is concerned with whether farmers who use information from agricultural extension officers and attend agricultural extension courses are more productive. Results from crosstabulations indicate that 95% of the irrigation farmers attend agricultural extension courses and 92% of the dairy farmers also attend these courses. In the regression analysis the farmers attendance at the courses was significantly important for

cotton accounting for 17.3% variance in its output, 3.7% variance in the output of wheat and just 0.6% in the output of milk. Both results from crosstabulations and regression confirm that farmers who frequently use information from agricultural extension officers are more productive. That variable accounted for 32.9% variance in cotton output, 3.4% in wheat output and 3.3% variance in milk output. As such it is a significant variable for higher farm output.

Although farmer's age was not significantly important in the regression for milk output and yet in the crosstabulation results for milk output, the middle aged farmers are the most productive; this variable was significantly important for cotton and wheat output through crosstabulations and regression. The positive relation of farmer's age to higher farm output answers the third research question concerned with whether farmer's ages have any relationship with farm output. The same question is also concerned with whether the age of a farmer's family members has any relationship with farm output. In response to this part of the question, the age of family members over age 10 came out as significant for the output of cotton only since it is a more labour intensive crop than wheat and milk. The age of farmers and their family members as a source of labour are consistent with the results that larger families are more productive for cotton and also answers question four which asks whether the number of people

living in a farmer's family have any effect on a farmer's output.

In response to question five which asks whether farmer's previous farming, dairy or irrigation experience is important for increased farm output. Crosstabulational results show that there is a strong relationship between these experiences and milk output but for cotton output, farmer's previous farming experience shows no clear pattern for its output and yet cotton appeared to be affected by previous irrigation experience. As for wheat, neither of the experiences have a marked impact on wheat output. In the regressional results, experience was also not significant for cotton and only farmer's previous irrigation experience was significant for wheat accounting for 2.9 variance in wheat output. For milk, both experiences were significant. Also, results from the analysis show that farming experience in the scheme accounts for 11.1% variance in the output of wheat and it is most important for milk output accounting for 8.5% variance. This experience did not come out significantly for cotton output.

Unlike farming experience in the scheme, farmers use of farming information from the radio and agricultural publications, for cotton and wheat, information from the radio was significant for the output of milk. These results answer question seven which asks whether farmers who frequently obtain farming information from the broadcast and agricultural publications realize high farm output.

Question eight is concerned with whether there is any relationship between a farmer's use of a particular cowbreed and increased milk output. Results obtained from the analysis show clearly that type of breed has an important influence on milk output. For instance farmers who use Fresian and crossbreed dairy cows realize higher milk output, although the significance of this variable accounted for 1.3% variance in the milk output.

Question nine asks whether a farmer's exposure to non-formal and informal educational factors substitutes or supplements for formal education in order to realize increased farm output. In general the results show that farmers' exposure to informal and non-formal education does only complement their limited formal education, but that the combination of the two have a positive relationship to higher output. From the crosstabulations, the picture is not all that clear but the regression shows the majority of the factors which are significantly important for the output of cotton, wheat and milk are either non-formal, informal education or both.

Data analysis in this chapter show that all farmers in both schemes are located in regions with extensive extension services, but the number of individual contacts with extension agents varies from one farmer to another. The farm output levels for the two schemes show that farmers' frequent contacts with extension agents combined with their length of farming experience has a positive

relationship to high farm output.

When comparing the historical information in chapter two and the results from the data analysis in this chapter, we find that:

(a) From the discussion in chapter two, these farmers went through the pre-independence education system where most of them only managed to learn to read and write. But, because their formal education emphasized practical work, they developed the skills of field management in agriculture. The primary data analyzed in this chapter also confirms this when it shows that formal education for them only applied mostly where it is complemented by extension services and other informal and non-formal education sources or techniques.

(b) The discussion in chapter two also indicated the development of peasant agriculture where peasants had no access to good fertile land. At independence this stringent system was reversed but with caution because it is not all people who till the land who are good farmers. But, for those who got good land with all facilities available like the farmers under study, it was a great motivation for them to produce high yields. Although the primary data in this chapter does not necessarily prove this fact, one of the most likely variable which could have influenced farmers' farm output is most likely to be the farmers' exposure to the new productive environment provided by the state.

(c) Last but not least, the information discussed earlier in chapter two, shows very positive research results in the effect of extension approaches to agricultural farm output. It is very clear from that data that agricultural extension services are very effective for farmers' farm output. This phenomenon was also shown in the results from this chapter's primary data analysis. Extension services featured as a significant variable accounting for the variations in milk, cotton and wheat output.

From the foregoing analysis, it is established that educated farmers (either formally, informally, or non-formally) are more active in seeking information and that they make better use of the acquired information. From these results, extension services by themselves are not a satisfactory substitute for the whole package of education plus information, but some form of education remains a big factor in the farm output of small-scale farmers. However, the following chapter summaries an overview of the study, major findings, implications drawn from the study and recommendations for further studies.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

INTRODUCTION

The preceding chapters have traced the development of an idea which has been enshrined in public policy of both economically developed and less developed countries. The idea is that knowledge and skills possessed by individual farmers or workers enhance their productive capabilities such that they constitute capital in the same sense that the physical means of production constitute capital. This idea has become the basis for policies and programmes in formal and non-formal education in capitalist and socialist states alike.

In this study, human capital theory has been examined to assess the influence of education on the farm output patterns of small-scale farmers in Model "C" Resettlement Schemes in Zimbabwe. One way of determining the validity of a theory is to determine the effect of practices derived from it. Halsey (quoted in Byrne, et al., 1975 B:32) states that "theories postulate paths to stated ends, therefore to test the validity of a theory is to evaluate the effectiveness of a policy which expresses it." The results from the primary data discussed in chapter five of this thesis, clearly show how the Zimbabwe policies on human capital and modernization of agricultural practices especially in the Model "C" Resettlement Schemes under study have had an effect on the farm output levels of cotton, wheat and milk.

OVERVIEW OF THE STUDY

THE STUDY

This thesis examines the effect of formal, informal and non-formal education on the level of the small-scale farmers' farm output to see whether education has been a factor that contributes to the farm output of individual farm families in the schemes under study. The two Model "C" Resettlement Schemes which were used for this study are Middle Sabi and Rusitu Resettlement Schemes. The former is an irrigation scheme where farmers grow cotton and wheat and the latter is a dairy scheme. Both schemes are specially designed for small-scale farmers with small land holdings but commercially farmed to certain recommended standards. The farming system practised at each one of these schemes is generally a representative of farming activities as at similar Model "C" Resettlement Schemes elsewhere in Zimbabwe. The Human Capital approach was adopted as the main conceptual framework for this study because it entailed focusing on education as a highly instrumental and even necessary approach to improve the farm output capacity of small-scale farmers in the Model "C" schemes and the general peasant farmers in Zimbabwe.

One aspect of qualitative improvement in human capital was the change which occurred in the psychological orientation of the farmers to the practice of modernized farming techniques. This was important because farming on these schemes is an innovation to farmers since most of the farmers were previously subsistence cultivators. Another

variable that was important was the relationship between the farmers and the state and this had implications for a dependency theory. The assumption here is that the development or underdevelopment of the schemes was related to farmers' dependency on the state.

Two main issues were dealt with in the literature review: (a) What different writers refer to as education and (b) How education is related to increased farm output. Some of the main points noted from the literature review on the nature of education are as follows:

(1) According to Dahama and Hatnagar (1980:3), education is the process of bringing desirable change in the behaviour of human beings. They also define education as the process of imparting or acquiring knowledge and habits through instruction or study.

(2) Education is the influence exercised by adult generations on those that are not yet ready for full participation in all aspects of life in the society. Its object is to stimulate and develop in the younger generation a certain physical, intellectual and moral states which are demanded of him by both the political society as a whole, and by the particular milieu for which he is specifically destined (Durkheim, 1972:204). According to Durhkeim's definition, education is the organized intelligence of a society functioning to consolidate in each successive generation the values, norms and habits of thought which are embedded in its culture.

(3) Psacharopolous and Woodhall (1985:3) say that education, like other forms of investment in human capital, can contribute to

economic development and raise the incomes of the poor just as much as investment in physical inputs such as improved communications systems, power etc.

The above definitions show that when learning is progressing towards certain goals that have been established in accordance with a philosophy which has been defined for and is understood by the learner, it is called "education". With the development of society, education has been broadly classified as "formal" and "non-formal" education. Formal education is basically an institutional activity, uniform and subject-oriented. It is full time, sequential, hierarchically structured, leading to certificates, degrees and diplomas. On the other hand, non-formal education is flexible, life, environment and learner-oriented. It is also non-authoritarian, mobilises local resources and it is built on learner-participation.

The main points noted from the literature review on how education is related to farm output or development were that:

(1) In general, there is a positive relationship between level of formal education and farm output because it is assumed that it is highly instrumental and even necessary to improve the productive capacity of a population. In other words, the argument is that an educated population is a productive population.

(2) The non-formal education programmes such as agricultural extension is also related to increased farming output. The rate of return on agricultural research and extension education from Griliche's

(1964) study of 68 regions in the United States was estimated to be 300%, which emphasizes the importance of education, research and extension for increasing farm output.

(3) When Jamieson and Lau (1980) and Lockheed, Jamieson and Lau (1980) examined the relationship between the educational levels of farmers and their farm output, they produced solid evidence for the positive effects of education on production, productivity and farmers' incomes. However, there seems to be a two-way relationship between education and other investments to improve farm output. Firstly, the relationship of education on farmers' output is considerably greater when complementary inputs such as fertilizers or new types of seed are available. Secondly, education, particularly literacy and numeracy, is often a prerequisite for the introduction of modern farming methods that rely on fertilizers and new types of seed (Perraton, 1983:75).

The major instrument which was designed specifically for this study was an interview schedule (see Appendix A, B and C, for the schedule and the questions therein). Information concerning the socio-economic background characteristics of the respondents, their farming knowledge of the schemes' operations, their source of information and help about their respective farming activities and their literacy levels was solicited.

Permission to conduct the study at Middle Sabi and Rusitu Resettlement Schemes was sought through a formal letter to the General

Manager of the Agricultural Development Authority (See Appendix D for the letters). The interview schedule was administered to the farmers at Middle Sabi and Rusitu Schemes between January and March, 1990. Altogether, interviews were completed with 43 farmers at Middle Sabi and 205 farmers at Rusitu Schemes. After coding, the data was analyzed using crosstabulations and multiple regression.

DISCUSSION ON FINDINGS

This study shows that some formal education for both the farmer and family members is important for farm output. Nevertheless, informal and non-formal factors were found to be important for higher farm output. The amount of variance accounted for by the seven most important independent variables in this study, whether cumulatively or individually is much less for milk output than for either cotton or wheat. While 61.1% of the variance in cotton output and 39.5% of the variance in wheat output are accounted for by the variables included in this analysis, only 16% of the variance in milk production is accounted for by these variables. The following is a summary of the major findings of the study:

In regards to the hypotheses that farmers with high formal education realize high farm output, this study gives limited support to the effects of formal education on the farmers' farm output. Although there is enough for us to sketch out the constraints within which such education must work, there is a much less clear relation between

farmers' formal education and farm output, than informal and non-formal education and farm output. However, formal education for the farmers' family members over age 14 had positive contribution to cotton and wheat farm output but not for milk. Since formal education for members of a farmer's family had some positive contribution to the farm output of cotton and wheat, it appears that increased farm output needs some formal education in a farmer's family in order to interpret and implement innovations and new farming technology.

Consistent with the second hypothesis that farmers with greater exposure to informal and non-formal education have higher farm output, this study shows that farmers who have more frequent contacts with their agricultural extension officers (non-formal education) realize higher farm output. Extension Services assume significant proportions in all the crops and milk production. Therefore, it also re-affirms evidence from the literature that extension service activities are generally regarded as complimentary to formal education of farmers and their family members (Lockheed, Jamieson, Moock and Shrestha, 1980). It also shows that a farmer needs some formal education (since only the education of family members was significant on new crops) combined with continuous exposure to effective extension services and attractive farming facilities in order to be highly productive.

One of the major findings from the study shows that farmers who are exposed to non-formal education through their attendance at agricultural extension courses are more productive in both crops and

milk output. This finding goes hand in hand with the conclusion that it is the farmers who are in frequent contact with their agricultural extension officers who do attend these courses. The informal and non-formal education which farmers obtain from attending these courses increases the likelihood of the farmer benefiting from the extension services.

Many developing countries like Zimbabwe do not have the necessary financial means to provide intensive extension services on a regular basis to rural areas, and in some cases radio might be the best substitute from the economic standpoint. Consistent with that, this study has shown that farmers' frequency of listening to agricultural broadcasts from the radio is important for cotton and wheat higher output. Also the farmer's frequency of reading farming information from the agricultural publications is an important factor for higher milk output. Three studies (McAnany, 1980; Jamieson, McAnany, 1978 and Birkhaeser and Evenson, 1989) offer numerous examples of the use of radio in rural development projects. They show that this is now one of the least expensive technology and, if used judiciously, could have a significant impact. Studies made by Perraton, Jamieson and Orivel (1981) in Malawi on the respective costs of the different channels of information available to farmers also confirm that extension services, radio, printed matter, training courses, etc., radio by ~~is~~ far the least expensive channel for the amount of information received by farmers.

The finding concerning the relationship between the number of years a farmer spends producing a certain crop or product such as milk and his/her increased output of that crop or product, led to the conclusion that these farmers could be expected to be more productive given their relative long experience in the schemes. Also, there is need for a thorough selection of farmers for these schemes so that they can be able to productively farm for a long period without being evicted. Poor selection results in having less productive farmers who cannot match the required farming standards and they end up being evicted from the schemes within a short period due to low farm output. There is no clear evidence from the literature about this relationship. However, Mullers' work (1974) used a sample of California dairy farms to argue that not only formal education is important but familiarity of managers/farmers with information sources, enables them to improve farm output. In this case, familiarity can only be obtained through longer experience in the farming activity.

Although there was no significant mention in the literature about the relationship between farmer's age or that of his/her family members and farm output, the findings from the regression analysis suggest a small association between a farmer's age and cotton output, but for wheat, older farmers were more productive. The age of the farmer's family members (i.e. those over age 10) is positively significant for increased milk output. Results from the crosstabulations indicated that farmers aged 40 to 49 were the most productive ones for cotton output.

is a curvelinear relationship between age and farm output, as such, the strength of the relationship was affected. Farmers' age affects both the size of their families and is reflected in the age of their children. This finding confirms the fact that older farmers combine their long farming experience with their older and larger families as a significant source of farm labour as well as a potential source of information if they possess a reasonable amount of education to obtain higher farm output. The above is also consistent with the finding that it is the farmers who have more people in their families who use that labour source for higher cotton output because growing of cotton is more labour intensive than wheat and milk. Also, since most farmers in these schemes were getting to the age of 45 and above, thus implies that sooner or later they would be highly dependent on their younger family members in order to continue being highly productive.

The findings from this study also show that there is a positive relationship between a farmer's use of a particular cowbreed and increased milk output. The cows which came out as significant contributors to farmer's higher milk output are Fresians and Crossbreeds. Farmers at Rusitu are encouraged to use crossbreed cows for dairy because that breed is more suitable to the local conditions and can easily be managed by small-scale farmers who have limited commercial dairy experience. This finding supports the conclusion that the dairy farmers at Rusitu are adopting the encouraged extension innovation of using high yielding dairy cows suitable to the local

conditions. Although a few farmers who own the Fresian breed realized the highest milk output, the majority who are acquiring the recommended breed own the Crossbreed which was second best in terms of milk output.

The positive relationship between farmers milking crossbreed cows and increased milk output implies a need for the local extension officers to continue encouraging farmers to buy crossbreeds as opposed to their local Shona breeds or the hybrids which cannot stand the harsh conditions in the scheme. It also implies that the administering agent - A.D.A., must continue to breed a suitable crossbreed to sell to these farmers.

This study also shows that the majority of farmers in these schemes, more so at Rusitu than Middle Sabi, had subsistence farming background prior to joining into the schemes. Also, at Rusitu, most of the farmers who have some formal education tend to be employed elsewhere and use proxy farmers on their plots. Such a situation again throws some questions on the original special criteria which were applied in the selection of settler farmers. Officially, settler farmers were selected on the basis of the need in the following order of priority:

(1) the unemployed and landless,

(2) former commercial farm workers and,

(3) people displaced from their land by large public projects.

The implication of the above strategy was that settler farmers

were chosen at random, without due consideration of the skills required for the enterprise in which they were to be engaged. While it is true that most of the population depends on agriculture for survival it does not necessarily follow that all these individuals are agriculturalists or interested in farming. There is therefore a danger of giving a scarce resource to people who may neither have the interest nor the ability to optimally utilize the land resources. This is not only uneconomical to these people, but to the nation as a whole. It is uneconomical to these people because they will be getting an economic resource and yet they cannot make a living out of it.

As far as the nation is concerned, it is uneconomical because agriculture is the base for any economic development. For instance, industrialization has occurred in other countries because it was partly subsidized by the agricultural sector. Zimbabwe has a healthy agricultural sector, because of its diversification. Therefore, if this cannot be maintained in an active and prosperous agricultural industry, then the undesirable effects of starvation and chaotic industrial development will result. This may not only retard economic development of the country, but may plunge the country into becoming a net food importer. These and other reasons which have not been able to be covered in this study, dictate that the focus be shifted from the desire to purely satisfy land hunger to allocating good land to productive farmers.

It is therefore logical at this stage for government to critically

analyze the selection criteria with a view to change it in favour of farmers who can productively utilize land. The selection of farmers with some formal education, master farmers and those whose farming track record can be supported by the Agricultural and Technical Extension Services (Agritex) can offer a possible solution to this.

The limitations of the results show that there is need for qualitative studies to throw more light on how the observed relationships operate in a modernized farming environment. Also, there is need for qualitative studies to examine the same observed relationships in a normal small-scale or peasant farming environment in order to see the differences.

RECOMMENDATIONS FOR FURTHER STUDIES

In order to view the results of this study in the proper context, one must look not only at what research has been done, but also at what remains to be done. The following discussion looks briefly at a number of areas for research that relate to the farm output of small-scale farmers.

A continuous farm output "evaluative process" on a yearly basis would be a considerable step forward in understanding increases or decreases in the farm output of A.D.A.'s agricultural projects which include Model "C" Resettlement Schemes. While the present study examines the influence of a number of independent variables to farm output at a point in time, continuous evaluative process would

elucidate the importance of these and other variables for higher farm output over time. Farm output evaluation of each project administered by A.D.A. would determine the validity of the agricultural operations program. It would also access the competencies of the agricultural extension personnel including the settler farmers themselves and provides data for inferential and judgmental statements about the projects or programs in operation.

Some work on an inservice extension education and adult education program for field agricultural extension staff and farmers would be a vital component of A.D.A.'s manpower development program. This would ensure continuity of better performance and high farm output. In addition to A.D.A.'s input, it is recommended that the adult education program for the illiterate and semi-literate farmers be adopted by the Ministry of Education and Ministry of Lands, Agriculture and Rural Resettlement because higher farm output is achievable when farmers and their family members are having some basic formal education in order to read, write and understand the ever increasing and changing agricultural technology in the modernized Model "C" Resettlement Schemes. This recommendation is based on the findings that most settler farmers of Rusitu Small-Scale Dairy Resettlement Scheme are not able to read or write and yet they are expected to be highly productive using the new technologies being implemented on the scheme.

As is apparent from the review of the literature, the identification of formal and non-formal education including

agricultural extension education effects on farm output is a complicated task because there are a number of economic, socio-cultural factors and infrastructural variables that affect agricultural performance or farm output. This is probably more important in the case of Rusitu Scheme where only 16.1% of the variance in milk output was accounted for by the seven independent variables. Also, identification of extension effects is complicated because the extension input itself is difficult to measure and requires utilization of proxies.

Studies such as those outlined in the literature review and the findings from this study give supporting evidence that extension efforts can have a significant effect on farmer's output. But, there is limited evidence regarding the profitability of investment in extension services. The few studies which were undertaken to evaluate the use of radio in place of extension workers, demonstrate that radio was the cheapest medium of communicating farming information to more farmers than extension agents. Given the limited number of such studies that are available on the impact of extension on farm output and that it was not possible to establish empirically the circumstances which are conducive to extension effectiveness in this study, it is recommended that there be a continuous flow of research, to boost farmers' output.

In order to ensure optimum land utilization, it is recommended that government changes the current settler selection system to give more emphasis to farmers with some basic formal education, master farmers, or farmers with the potential to fully utilize the land.

It is further recommended that A.D.A. in conjunction with the Ministry of Lands, Agriculture and Rural Resettlement investigate the possibility of embarking on a special training program for the progressive and productive settler farmers aimed at producing skilled and commercially orientated black farmers who will further be offered the opportunity to become commercial farmers on large commercial farms. This can be used as a motivation strategy for farmers.

In view of the length of time some farmers at Middle Sabi Stage III A have been successfully operating with yearly increasing farm output levels, in order to motivate farmers, it is recommended that A.D.A. and Ministry of Lands, Agriculture and rural Resettlement should facilitate the farmers' permission to purchase their respective plots and have title deeds to their land/plots.

While the research possibilities outlined above do not constitute an exhaustive list, they do indicate a range of research needs. These are but some of the considerations that must be taken into account in considering the future of small-scale farmers' output in Zimbabwe. The important thing to note in this context is that work needs to be done in a wide variety of areas before there is a more conclusive and better understanding of the determinants of higher farm output.

In conclusion, future research on education and farm output, should analyze not only the already advantaged small-scale farmers in the Model "C" Resettlement Schemes, but also the majority of the disadvantaged small-scale farmers in the communal areas who have no

similar farming facilities. In addition, further studies should evaluate the efficiency of state farming as compared with small-scale farmers in Model "C" Resettlement Schemes. Also the relationship of the state farms with the small-scale farmers in these schemes should be evaluated. The blending of quantitative and qualitative data as implemented in this present research would appear to be a fruitful methodological approach for the other research suggested above. It is also hoped that information on education and farm output from this study has not only suggested possible solutions of low farm output by small-scale farmers; but that the results and recommendations may also highlight the great need for a realistic and unequivocal official land use policy for small-scale farmers including communal farmers in Zimbabwe. Also, there is need for a concerted effort by the Government, parastatals dealing with small-scale farmers, private sector and non-governmental organizations in formulating and implementing better and faster adult education programmes in rural areas in order to improve farmer's farm output.

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APPENDIX A

INTERVIEW SCHEDULE A

INTERVIEW SCHEDULE A

Interview Schedule A was used for collecting data from the following respondents:

- Middle Sabi Stage III A Settlement Scheme Settler Farmers (irrigation farmers for cotton and wheat) in the Manicaland province of Zimbabwe.

These respondents were the actual Settler farmers/plot holders and their farm families are responsible for the day to day farming activities on their respective plots for the production of Cotton, and Wheat from this Scheme. The interview was divided into Sections 1, 2, 3, 4, and 5.

- The Settler farmers/Plot holders.

INTRODUCTORY STATEMENT TO FARMERS IN THE MIDDLE SABI STAGE III A RESETTLEMENT SCHEME

I am doing a study of the farming experiences of settlers in the Middle Sabi and Rusitu schemes. I would like to get information about how productive your farm plots have been and what successes and problems you have had since you settled here. I also want to find out about how you carry out your farming operations and about the kinds of assistance and information that are available to you. If you will answer questions about these things as well as tell me a little about yourself, I hope to find out which formal, informal and non-formal educational variables are most important for your farm output.

I am doing this study as part of my studies at the University of Alberta in Canada. In addition, because I will be returning to my work here in Zimbabwe, I hope that what I learn will allow me to be of more assistance to farmers like you. A.R.D.A. and the University of Alberta have authorized me to do this study but your participation in this study is voluntary, it depends on your decision. If you decide to help me by answering my questions, I want you to know that no one but me will ever see or hear what you tell me. I will be writing a report of my study but the report will only talk about what I learn from all the farmers combined. The report will not mention anything that one particular person said to me.

QUESTIONNAIRE FOR FARMERS AT MIDDLE SABI

I would like to begin by asking you a few questions about your farm, your family and you.

1. What is your Plot number? _____

2. Do you live on your plot? (a) Yes (b) No

3. How many hectares are there in your plot? _____

4. How many people live with you in your family? _____

5. Are any members of your family attending school? What is their relationship to you, their age and the last class they completed?

	Relationship	Age	Last class attended	Still continuing with school
(a)	_____	_____	_____	_____
(b)	_____	_____	_____	_____
(c)	_____	_____	_____	_____
(d)	_____	_____	_____	_____
(e)	_____	_____	_____	_____

6. How old are you? _____

7. How much schooling do you have?

   (a) None
   (b) Primary _____ years
   (c) Lower Secondary _____ years
   (d) Upper Secondary _____ years
   (e) Technical/vocational
   (f) Other _____

8. Can you tell me about your farming background before you came to this scheme?

   (a) Subsistence farmer

   (b) Small scale commercial farmer

   (c) Employee on a large scale commercial farm

(d) Agricultural extension worker

(e) Other (specify) _____

9. How may years were you engaged in this work before you came here?

_____

10. Did you have any previous experience with irrigation farming?

(a) No (b) Yes _____ years

11. When did you come to this scheme?_____

Now I would like to ask you some questions about farming in this scheme.

12. When you plant cotton, how many people work on your land?

	Number of Family Members	Number of Relatives	Number of Hired Labor
a) Preparation and Planting	[ ]	[ ]	[ ]
b) Growing Season	[ ]	[ ]	[ ]
c) Harvesting	[ ]	[ ]	[ ]

13. When you plant wheat, how may people work on your land?

	Number of Family Members	Number of Relatives	Number of Hired Labor
a) Preparation and Planting	[ ]	[ ]	[ ]
b) Growing Season	[ ]	[ ]	[ ]
c) Harvesting	[ ]	[ ]	[ ]

14. What type of seed do you use for your crops?

(a) Cotton _____

(b) Wheat _____

15. How much seed do you use per hectare?

(a) Cotton _____

(b) Wheat _____

16. How much fertilizer do you use per hectare?

(a) Cotton _____

b) Wheat _____

17. How often in one growing season do you use insecticides, pesticides or herbicides on cotton?

(a) Insecticides _____

(b) Pesticides _____

(c) Herbicides _____

18. How often in one growing season do you use insecticides, pesticides or herbicides on wheat?

(a) Insecticides _____

(b) Pesticides _____

(c) Herbicides _____

19. How many irrigation cycles did you use for your crops?

(a) Cotton _____

(b) Wheat _____

20. What is the source of your tillage?

(a) A.R.D.A. (b) Private (c) Other

21. What type of land preparation do you use?

(a(a) Ploughing (b) Discing (c) Ripping (d) Other

22. Please give your total yields in kgs. per hectare over the following cropping seasons?

	1984/85	1985/86	1986/87	1987/88	1988/89
(a) Cotton	[ ]	[ ]	[ ]	[ ]	[ ]
(b) Wheat	[ ]	[ ]	[ ]	[ ]	[ ]

23. How much of your crops were you able to sell last year?

	All	Half		None
(a) Cotton	|--------	|--------	|--------	|--------|
(b) Wheat	|--------	|--------	|--------	|--------|

24. How much income did you get from your produce last year?

_____

25. Where did you get money for your farm operations?

(a) Self (b) A.F.C. (c) Commercial Bank

25. What did you use the money for?

(a) Inputs (b) Labour (c) Other

27. If you had a loan, were you able to repay the loan from the sale of your produce?

(a) Yes (b) Partly (c) No

28. If you were unable to repay your loan, why was that so?

_____

_____

Now I would like to ask you some questions about how and where you get information and help about farming.

29. How often do you discuss farming methods, problems or productivity with?

	everyday	more than once a week	several times a month	once a month or less	very seldom
Family Members	[ ]	[ ]	[ ]	[ ]	[ ]
Neighbors	[ ]	[ ]	[ ]	[ ]	[ ]
Friends	[ ]	[ ]	[ ]	[ ]	[ ]
Farmers	[ ]	[ ]	[ ]	[ ]	[ ]
Farmers Groups	[ ]	[ ]	[ ]	[ ]	[ ]

30. How often do you get information about farming from?

	everyday	more than once a week	several times a month	once a month or less	very seldom
Radio	[ ]	[ ]	[ ]	[ ]	[ ]
TV	[ ]	[ ]	[ ]	[ ]	[ ]
Newspapers	[ ]	[ ]	[ ]	[ ]	[ ]
Agricultural Publications	[ ]	[ ]	[ ]	[ ]	[ ]
Extension Officers	[ ]	[ ]	[ ]	[ ]	[ ]

31. Which sources of information are the most useful? _____

32. Have you ever attended agricultural extension courses?
(a) Yes (b) No

33. If yes, what kind of courses have you attended? _____

_____

34. If no, why haven't you attended? _____

_____

35. What kind of problems have you experienced with your crops during the last five years?

_____

_____

36. How did you solve the problems?

(a) Hired a specialist
(b) Consulted an extension officer
(c) Consulted neighbors
(d) Other (specify) _____

37. What kind of advice would you give to a person who was just starting to farm in this scheme?

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B

INTERVIEW SCHEDULE B

INTERVIEW SCHEDULE B

Interview Schedule B was used for collecting data from the following respondents:

- Rusitu Small Scale Dairy Resettlement Scheme Settler Farmers (Dairy farmers) in the Manicaland province of Zimbabwe.

These respondents were the actual Settler farmers/plot holders and their farm families are responsible for the day to day farming activities on their respective plots for the production of milk from this Scheme. The interview is divided into Sections 1, 2, 3, 4, and 5.

- The Settler farmers/Plot holders.

INTRODUCTORY STATEMENT TO FARMERS IN THE RUSITU SMALL-SCALE DAIRY RESETTLEMENT SCHEME

I am doing a study of the farming experiences of settlers in the Middle Sabi and Rusitu schemes. I would like to get information about how productive your farm plots have been and what successes and problems you have had since you settled here. I also want to find out about how you carry out your farming operations and about the kinds of assistance and information that are available to you. If you will answer questions about these things as well as tell me a little about yourself, I hope to find out which formal, informal and non-formal educational variables are most important for your farm output.

I am doing this study as part of my studies at the University of Alberta in Canada. In addition, because I will be returning to my work here in Zimbabwe, I hope that what I learn will allow me to be of more assistance to farmers like you. A.R.D.A. and the University of Alberta have authorized me to do this study but your participation in this study is voluntary, it depends on your decision. If you decide to help me by answering my questions, I want you to know that no one but me will ever see or hear what you tell me. I will be writing a report of my study but the report will only talk about what I learn from all the farmers combined. The report will not mention anything that one particular person said to me.

QUESTIONNAIRE FOR FARMERS AT RUSITU

I would like to begin by asking you a few questions about your farm, your family and you.

1. What is your Plot number? _____

2. Do you live on your plot? (a) Yes (b) No

3. How many hectares are there in your plot? _____

4. How many people live with you in your family? _____

5. Are any members of your family attending school? What is their relationship to you, their age and the last class they completed?

	Relationship	Age	Last class attended	Still continuing with school
(a)	_____	_____	_____	_____
(b)	_____	_____	_____	_____
(c)	_____	_____	_____	_____
(d)	_____	_____	_____	_____
(e)	_____	_____	_____	_____

6. How old are you? _____

7. How much schooling do you have?

   (a) None
   (b) Primary _____ years
   (c) Lower Secondary _____ years
   (d) Upper Secondary _____ years
   (e) Technical/vocational
   (f) Other _____

8. Can you tell me about your farming background before you came to this scheme?

   (a) Subsistence farmer

   (b) Small scale commercial farmer

   (c) Employee on a large scale commercial farm

   (d) Agricultural extension worker

   (e) Other (specify) _____

9. How may years were you engaged in this work before you came here?

   _____

10. Did you have any previous experience with dairy farming?

    (a) No (b) Yes _____ years

11. When did you come to this scheme? _____

Now I would like to ask you some questions about farming in this scheme.

12. When you plant napier fodder, how many people work on your land?

	Number of Family Members	Number of Relatives	Number of Hired Labor
a) Preparation and Planting	[ ]	[ ]	[ ]
b) Growing Season	[ ]	[ ]	[ ]
c) Cutting Fodder	[ ]	[ ]	[ ]

13. How many people are involved in working in your dairy unit?

	Number of Family Members	Number of Relatives	Number of Hired Labor
a) Feeding and Milking Cows	[ ]	[ ]	[ ]
b) Cleaning and Delivering Milk	[ ]	[ ]	[ ]

14. What breed of cows do you use for dairy? _____

15. How many dairy cows do you have? _____

16. How many cows do you usually milk each day? _____

17. How many times do you milk your cows per day?

    (a) Once (b) Twice (c) _____

18. How often have you used artificial insemination on your cows?

    _____

19. What is the source of your tillage?

    (a) A.R.D.A. (b) Private (c) Other

20. What type of tillage power do you use for your land preparation?

    (a) Oxen (b) Donkeys c) Tractor (d) Others

21. Please give your total average milk yields in kgs. per cow over the following cropping seasons?

1984/85	1985/86	1986/87	1987/88	1988/89
[ ]	[ ]	[ ]	[ ]	[ ]

22. How much of your milk were you able to sell last year?

All	Half	None
|--------	|-------- |--------	|--------|

23. How much income did you get from your milk produce last year?

    _____

24. Where did you get money for your dairy farm operations?

    (a) Self (b) A.F.C. (c) Commercial Bank

25. What did you use the money for?

    (a) Inputs (b) Labour (c) Other

26. If you had a loan, were you able to repay the loan from the sale of your milk?

    (a) Yes (b) Partly (c) No

27. If you were unable to repay your loan, why was that so?

    _____

    _____

Now I would like to ask you some questions about how and where you get information and help about dairy farming.

28. How often do you discuss farming methods, problems or productivity with?

	everyday	more than once a week	several times a month	once a month or less	very seldom
Family Members	[ ]	[ ]	[ ]	[ ]	[ ]
Neighbors	[ ]	[ ]	[ ]	[ ]	[ ]
Friends	[ ]	[ ]	[ ]	[ ]	[ ]
Farmers	[ ]	[ ]	[ ]	[ ]	[ ]
Farmers Groups	[ ]	[ ]	[ ]	[ ]	[ ]

29. How often do you get information about dairy farming from?

	everyday	more than once a week	several times a month	once a month or less	very seldom
Radio	[ ]	[ ]	[ ]	[ ]	[ ]
TV	[ ]	[ ]	[ ]	[ ]	[ ]
Newspapers	[ ]	[ ]	[ ]	[ ]	[ ]
Agricultural Publications	[ ]	[ ]	[ ]	[ ]	[ ]
Extension Officers	[ ]	[ ]	[ ]	[ ]	[ ]

30. Which sources of information are the most useful? _____

31. Have you ever attended agricultural extension courses?
(a) Yes (b) No

32. If yes, what kind of courses have you attended? _____

_____

33. If no, why haven't you attended? _____

_____

34. What kind of problems have you experienced with your dairy cows during the last five years?

_____

_____

35. How did you solve the problems?

(a) Hired a specialist
(b) Consulted an extension officer
(c) Consulted neighbors
(d) Other (specify) _____

36. What kind of advice would you give to a person who was just starting to farm in this scheme?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX C

INTERVIEW SCHEDULE C

INTERVIEW SCHEDULE C

Interview Schedule C was used to double check the farmers' literacy and numeracy skills information given during the face to face interview and collect data from the following respondents:

(a) Middle Sabi Stage III A Settlement Scheme - Irrigation Settler Farmers for Cotton and Wheat; and

(b) Rusitu Small Scale Dairy Resettlement Scheme - Dairy Settler Farmers. Both schemes are in the Manicaland Province of Zimbabwe.

These respondents were the actual Settler farmers/plot holders responsible for the day to day farming activities on their respective plots for the production of cotton, wheat and milk from these schemes. Since this questionnaire was intended to assess their literacy and numeracy skills, it was administered to both schemes' farmers in their native language - Shona. An option of answering the English version of the questionnaire was also given to them.

- The Settler farmers/plot holders.

MIDDLE SABI IRRIGATION FARMERS FOR COTTON AND WHEAT

SHONA VERSION

Zvino ndava kuku kumbira kuti ipindure mi vhunzo inotevera iyi uchizvi nyorera pachako, kuitira kuti tiwane rumwe ruzivo rwaka wedzerwa pamusoro peku gona kwako kunyora, kuverenga ne samhu.

1. Ndapota, nyora zita rako zvizere ne kero yako pami tsetse inotevera iyi:

   _____

   _____

   _____

   _____

2. Nhamba yako yeku Kotoni Mariketi Bhodi ndiyani? _____

   _____

3. Nhamba yako yeku Gireni Mariketi Bhodi ndiyani? _____

4. Ndapota shanda samhu (zvibalo) dzino tevera idzi:

(a) 120 kg. Koroni
210 kg. Koroni
+ 116 kg. Koroni

(b) $1450.48
- 689.26

(c) $421.11 X 6 = _____

(d) 312 ÷ 3 = _____

MAZVITA CHAIZVO

ENGLISH VERSION

Now I would like to ask you to answer the following questions in writing in order to get a little bit of extra information about your literacy and numeracy skills.

1. Please write your full name and address on the following lines.

_____

_____

_____

_____

2. What is your Cotton Marketing number? _____

3. What is your Grain Marketing number? _____

4. Please calculate the following:

(a) 120 kg wheat
210 kg wheat
+ 116 kg wheat
_____

_____

(b) $1450.48
- $689.26
_____

_____

(c) $421.11 X 6 = _____

(d) 312 ÷ 3 = _____

THANK YOU VERY MUCH

RUSITU DAIRY FARMERS

SHONA VERSION

Zvino ndava kuku kumbira kuti upiadure mi vhunzo inotevera iyi uchizvi nyorera pachako, kuitira kuti tiwane rwumwe ruzivo rwaka wedzerwa pamusoro peku gona kwako kunyora, kuverenga ne samhu.

1. Ndapota, nyora zita rako zvizere ne kero yako pami tsetse inotevera iyi;

_____

_____

_____

_____

2. Nhamba yako yeku Dheri Mariteti Bhodi ndiyani? _____

_____

3. Ndapota shanda samhu (zvibalo) dzino tevera idzi:

(a) 120 kg. Mukaka
210 kg. Mukaka
116 kg. Mukaka
_____

_____

(b) $1450.48
- 689.26
_____

_____

(c) $421.11 X 6 = _____

(d) 321 ÷ 3 = _____

MAZVITA CHAIZVO

ENGLISH VERSION

Now I would like to ask you to answer the following questions in writing in order to get a little bit of extra information about your literacy and numeracy skills.

1. Please write your full name and address on the following lines.

_____

_____

_____

_____

2. What is your Dairy Marketing number? _____

3. Please calculate the following:

(a) 120 kg milk
210 kg milk
+ 116 kg milk
_____

_____

(b) $1450.48
- $689.26
_____

_____

(c) $421.11 X 6 = _____

(d) 312 ÷ 3 = _____

THANK YOU VERY MUCH

APPENDIX D

THE PRE-INDEPENDENCE STRUCTURE OF THE EDUCATIONAL SYSTEM IN ZIMBABWE

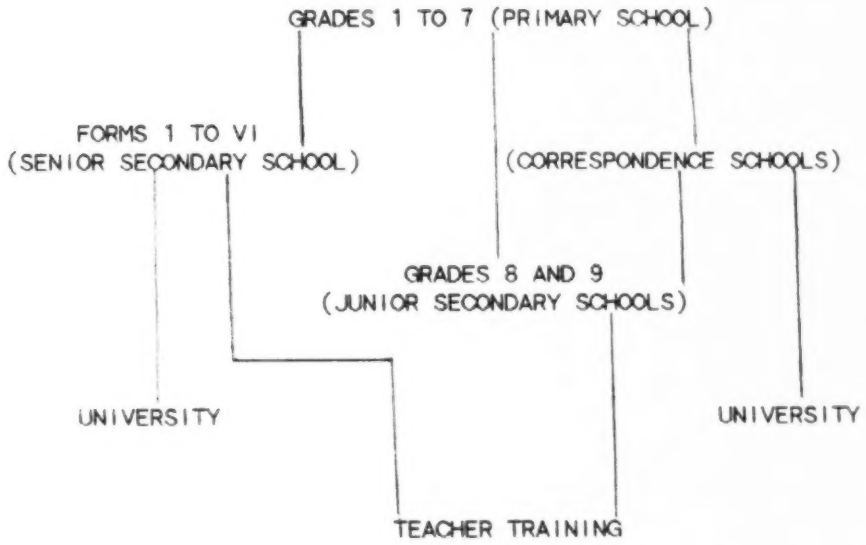
Schools were classified into the following various grades:

Grade A	Teacher training schools.
Grade B:	Primary school at which the headmaster's post had been approved as that of a permanent headmaster.
Grade C:	Primary school at which the headmaster's post had not been approved as that of a permanent headmaster.
Grade C(A):	A Grade C school which was eligible for a grant in terms of the African Education (Registered Schools) Regulations.
Grade C(U):	A Grade C school which was not eligible for a grant in terms of the African Education (Registered Schools) Regulations.
Grade D:	A primary or secondary school which provided part-time primary or secondary education for pupils who, for approved reasons were unable to attend any other grade of school.
Grade D(A):	A Grade D school which was eligible for a grant.
Grade D(U):	A Grade D school which was not eligible for a grant.
Grade E:	Special school, e.g. schools for deaf, blind, dumb lepers or otherwise physically handicapped.
Grade F:	Secondary school.
Grade F(1)	A Grade F school which provided full-time secondary education for pupils in one, or more classes, from Form I to Form VI.
Grade F(2):	A Grade F school which provided full-time junior secondary education for pupils in one, or more classes, from Grade 8 to Grade 9.
Grade G:	Domestic science and homecraft training for female pupils.
Grade H:	Correspondence schools.
Grade J:	A primary school which was established in a rural area of a European area, e.g. farm school.
Grade J(A):	A Grade J school which was aided by a government grant.
Grade J(U):	A Grade J school which was not aided.
Grade K:	School which provided full-time primary or post-primary education for pupils who were unable, for any reason, to attend any other grade of school; or full-time instruction or tuition designed to meet special needs.

Children were permitted to enter school at the beginning of the year in which they became seven years old but, for various reasons, some did enter school at an age somewhat over the average. From then on a child's progress up the educational ladder depended, not only upon his continued interest in school-work and ability in class, but also upon a availability of places at the higher levels. Mainly for the so-called

financial reasons, arising from the then stage of economic development in the country, it had not been possible to make education for the African child compulsory.

The educational ladder was as follows:



APPENDIX E

University of Alberta
Department of Educational Foundations
5 - 109 Education Building North
Edmonton, Alberta
Canada. T6G 2G5

September 25, 1989

The Secretary
Ministry of Lands, Agriculture and Rural Resettlement
Private Bag 7701
Causeway, Harare
Zimbabwe

Dear Sir:

RE: APPLICATION FOR AUTHORITY TO CARRY OUT A RESEARCH/STUDY ON RESETTLEMENT SCHEMES

Following A.R.D.A.'s application to you for financial assistance on the 13th June, 1988, for me to study a Ph.D. programme at the above university and your subsequent approval and application to the Ministry of Labour, Manpower Planing and Social Welfare for the same, I am glad to inform you that although I did not manage to get financial assistance by then, I managed to come here and started on my proposed programme with hope that in future some funding may be secured.

However, I have managed to successfully complete all my course work and the comprehensive examinations within a year, I an now due to carry out my research proposal back home in order for me to continue and complete my thesis.

I am therefore writing to seek your authority/permission for me to carry out my research on Resettlement Schemes, - the policies and procedures in Zimbabwe. Sincu I was a Settlers Programmes Coordinator with A.R.D.A. for six years, looking after the Model "C" schemes managed by A.R.D.A., I developed a special interest and concern on their varying levels of production. In view of this, my research title is: "The Effects of Education on Small Scale Farmers in Zimbabwe." I would have loved to do a thorough and detailed study of a wide range of small scale formers in Zimbabwe, but due to time scarcity and mostly financial constraints, I am restricting my study to the Model "C" Settlement Schemes with particular emphasis on Middle Sabi Stage III A and Rusitu Small Scale Dairy Resettlement Schemes.

In order to have a sound research, one needs to be aware and knowledgeable with the current government policies and procedures on such schemes, through reading the relevant documents, and I would be very grateful if you could also grant me permission to look into some of your Resettlement documents.

Issues on the aims, objectives and benefits of this study are covered in my attached summarized research proposal. May I also mention that I would do the research from January to April, 1990.

I hope my application will receive your most favourable consideration and support. Thanking you in anticipation.

Yours sincerely,

Daniel Mtetwa

AGRICULTURAL AND RURAL DEVELOPMENT AUTHORITY

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22 November 1989

Mr D Mtetwa
University of Alberta
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Edmonton, Alberta
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Dear Mr Mtetwa

Thank you for your letter of 25 September 1989. My apologies for the delay in replying to you.

The Authority has no objection in you carrying out a research project within the organisation specifically at Middle Sabi Stage III A and Rusitu Small Scale Dairy Resettlement Schemes. However, the cost of the research will have to be borne by yourself.

Wish you the very best in your studies.

Yours sincerely

DR J N MADE
DEPUTY GENERAL MANAGER
AGRICULTURAL OPERATIONS, PLANNING AND DEVELOPMENT

SE:/4/4C

25 January 1990

The Estate Manager
Middle Sabi Estate

Dear Sir

re: AUTHORISATION FOR MR D MTETWA'S RESEARCH

This is to certify that Mr Mtetwa is authorised to carry out his research at Middle Sabi Estate (Stage IIIA Settlement Scheme).

Mr Mtetwa is currently a PhD candidate at the University of Alberta, Edmounton, Alberta, Canada and he is back in Zimbabwe on a field research for his thesis. The title of his thesis is: "The Effect of Small Scale Farmers in Zimbabwe."

The study aims at identifying the ways in which education (formal, informal and non-formal) can contribute more effectively to increase the productivity of induvidual settler families in the ADA administered Model "C" Settlement Schemes. In his research, an attempt will be made to identify and compare the differences between the productivity of farmers with some formal education and those without any education or schooling to see in what ways, if any, their education contributed to their increasing productivity.

The anticipated benefits to Zimbabwe and ADA in particular, will be that policy/decision makers, administrators, planners and extension staff will have a better understanding of how farmers actually use their education to increase their productivity. Also, this will be valuable information which could assist us in the planning and implementation of future schemes and the selection of productive settler farmers.

Could you please give Mr Mtetwa all the required support and co-operation to facilitate this research. He would like to do the following:

- interview individual settler farmers;
- look at and collect data on individual farmer's yields from 1984/85 to 1988/89;
- get a record of individual farmer's educational background;
- services (extension or others) given to the farmers by ADA;
- general farmers experience in their field of specialisation and
- get some assistance from relevant staff during the collection of this data.

Thank you for your co-operation.

DR J H [illegible]
DEPUTY GENERAL MANAGER
AGCRAL TRAINING & DEVELOPMENT